



FRIDAY, MAY 27.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—St. Paul & Northern Pacific.

Elections and Appointments.—Alabama & Tennessee, H. S. Chamberlain, President.—Atlantic City & Brigantine Beach, John K. Cuming, President.—Cincinnati, New Orleans & Texas Pacific, C. C. Harvey, Vice-President.—Chicago, St. Louis & Paducah, William K. Murphy, President.—Erie & Illinois, C. W. Reed, President.—Gulf, Colorado & Santa Fe, W. B. Strong, President.—Kansas City, St. Joseph & Council Bluffs, G. W. Nohl, Superintendent.—Kansas, Gulf & Short Line, W. P. Homan, General Manager.—Lake Shore & Michigan Southern, G. R. Hardy, Chief Engineer.—East & West Alabama, George H. Pell, President.

Changes and Extensions.—Alabama: Mobile & Dauphin Island is in process of construction.—Dakota: St. Paul, Minneapolis & Manitoba is completed 95 miles west of Minn.—Florida: Suwanee & Gulf River will build from Cedar Keys to Branford.—Georgia: Central will extend line from Blakely to Columbia.—Illinois: Chicago, St. Louis & Paducah is building from Marion eastward.—Nebraska: Missouri Pacific lets contracts for new lines.—Texas: Galveston, Sabine & St. Louis is changed to standard gauge.—West Virginia: Cumberland, Moorefield & Southwest Virginia institutes survey.—Wisconsin: Chicago, Milwaukee & St. Paul is building from Albany to New Glarus.—Wisconsin: Wisconsin Central extension to Colby mine is finished.

New Companies Organized.—Chippewa Falls & Ashland files articles in Wisconsin.—Eufala & Southeast Alabama files articles in Alabama.—Freeport, Dodgeville & Northern files articles in Wisconsin.—Havana & Quincy files articles in Illinois.—Iowa Railroad Co. is incorporated in Iowa.—Montana & Coeur d'Alene files articles in Montana.—New Mexico Central files articles in New Mexico.—Northern & Eastern Midland files articles in Illinois.—Randolph Belt files articles in Missouri.—St. Mary's & Southwestern files articles in Ohio.—Southern Pacific Branch files articles in California.

Leases and Sales.—Indianapolis, Decatur & Springfield is sold.—Memphis & Little Rock is sold.—Mexican National road is sold.—New York, Chicago & St. Louis is sold.—New York, New Haven & Hartford will lease the Connecticut Valley and Naugatuck roads.—Southern Pacific obtains control of the Portland & Willamette Valley.

Traffic.—Anthracite coal shipments for the week ending May 21 show a decrease of 10.6 per cent. compared with corresponding week last year; bituminous shipments show increase of 65.8 per cent.; coke, for week ending May 15, shows decrease of 76.4 per cent. Cotton receipts, interior markets, for week ending May 20, show decrease of 46.6 per cent., compared with corresponding week last year. Shipments show a decrease of 60.3 per cent.; seaport receipts show decrease of 63.9 per cent.; exports, a decrease of 55.2 per cent.; cotton in sight is less than at the same date last year by 42.8 per cent.

Annual Reports.—Canadian Pacific for the year ending Dec. 31, 1886, shows an increase of 20.5 per cent. gross and 14.8 per cent. net.—St. Louis & San Francisco for the year ending Dec. 31, 1886, shows a gain of 11.2 per cent. gross and 8.9 per cent. net.

Contributions.

Reform in Car Service.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The railroads of this country own about 810,000 freight cars used in revenue service, which represent capital to the amount of at least \$400,000,000. Is there another investment in railroad property approaching anything like this magnitude of which the administration is so imperfect, so loose, so unbusinesslike? That the facts warrant the assertion that this interest is suffering for want of proper administrative effort is indeed bad enough, but the knowledge that the matter is growing worse and worse, places the question before railroad managers to say the least, in a very peculiar light. During the past ten years, the number of freight cars has been increasing at the rate of about 20,000 per year, while the mileage or performance per car per day has been steadily decreasing. In 1876, two prominent fast freight lines were together running 7,000 cars, which in that year made an average mileage of 77 miles per car per day. Three years later, with 8,000 cars, the average day was 72 miles. Six years later they had 10,000 cars, which made only 44 miles per car per day. Ten years later (1886), we find these two lines running 15,000 cars, with the mileage reduced to less than 40 miles per car per day. These figures show that the object for which equipment lists are increased is being practically defeated through the causes which lead to decreased car movement.

The average mileage per car per day of the freight cars owned by six prominent roads, aggregating over 165,000 cars, has now reached the very low figure of 24 miles, representing an earning at $\frac{1}{4}$ cents per mile, of only 18 cents per car per day. It is estimated that the average cost of maintenance per car per year is about \$75, to which add \$80 for

interest on original investment, and we have the cost per car per year at \$105, as against \$65.70 earnings.

These figures show that it is unprofitable from a car service standpoint to own cars for general interchange business under the present methods. They also demonstrate another very important fact, viz.: That there are more freight cars in service to-day than the wants of business under fair car movement would require, or that the present aggregate tonnage is not sufficient to afford a fair performance for the number of cars now in service. Still, we hear the cry, "more cars, more cars," whenever there is an unusual rush of freight; and so the car builders, and consequently the side track builders, are kept busy.

The utility of a car is represented by the number of tons of freight it may transport from one point to another, or by the number of miles it runs in a given time. Freight cars are moved in transit at the rate of from 10 to 18 miles per hour, including stops. The above average of 24 miles per day shows the cars in motion less than 2 hours out of every day—on sidings 22 hours; in motion 2 hours. Let us devise a means by which our cars will be utilized for the movement of freight four hours out of every day, which is certainly little enough to expect; and, as a result, we move the same amount of tonnage with one-half less cars, besides making a corresponding decrease in expenditures for side tracks and yard facilities.

"It is not more cars we want; but more movement of cars." Nearly all railroad managers recognize the necessity of an improved car service system, but many also think there are great and insurmountable obstacles in the way. Fear of these doubtless explains the inaction among officers; but healthy signs of effort at reform begin to appear, a noteworthy one being the investigations under way in Commissioner Fink's office.

To all companies owning enough cars to handle their own freight, a change in the present methods must be most desirable; but if we would receive a fair performance from the cars now in service taken as a whole, a change is absolutely necessary. The question then is: How shall the change be effected? The first step is to know thoroughly the causes which make a change necessary. The next step is the introduction of a force that will neutralize such causes on an equitable basis.

The great defect of the present system is the feature which permits one company to detain and misuse the cars of another with impunity. It, in fact, places a premium upon car detention—there being no expense so long as the foreign car stands idle, but a tax whenever it moves. A system which leaves the earnings of cars away from home entirely at the will of the company receiving them, which provides no incentive for the prompt handling and return of the foreign car, and which seems to offer an inducement for certain roads to build side tracks instead of warehouses, should be reformed out of existence. It is true there are car accountants and lost car agents, whose business it is to trace for and prevent delay or misuse of cars; and perhaps some roads, by concentrating their energies upon the work of tracing their own cars at home and abroad, succeed in obtaining a fair movement; but we have before us the fact that even with the best practice under the present system we have a constantly decreasing mileage. This is accounted for by the fact that a car accountant tracing to another road for the return of his cars, at best exerts only an outside influence, partaking of a persuasive nature.

The remedy for these defects is a per diem charge in addition to the mileage rate for each and every day that the cars are away from home. This will be (1) equitable, and it will (2) make it cost money to detain foreign cars. It will, (3) by reversing the conditions, place the premium upon car movement instead of detention. The accounting admits of a complete check and the system becomes at once a stimulus—the inside force—for the prompt handling and return of foreign cars. The sum of all this is that instead of car accountants exhausting their energies in trying to get their cars home from foreign roads, they can give their attention almost exclusively to the home road, where they have authority to see that the best possible performance is had from their own cars and that the use of foreign cars is kept at the minimum. This is the principle which, in operation, will improve car service.

I have carefully considered the report of the Car Accountants Association on the per diem question, as given in the *Railroad Gazette* of April 29, and from a practical knowledge of car service matters, and anticipating the results in operation on the line with which I am connected, where we have almost every possible condition known to the general interchange service, I believe the plan there recommended is exactly the thing. What objections are there to it?

CAR SERVICE.

Draft Gear.

CLEVELAND, O., May 20, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in your valuable paper of May 13, 1887, an article signed "R. P. C. S.," under the head of "Draft Gear." There is also in the same article a rough sketch of a train of cars, dotted lines showing the strain upon cars while being drawn by the engine, and a suggestion as to continuous draw-bars.

Now, I think the writer of that article has brought forth a very important subject, yet not a new subject. Continuous draw-bars have been applied to cars for a great many years, but it has always seemed to me that the application has been very poor from the fact that in drawing the car in a given direction the strain has been wholly upon the rear end of the car, and when, through some accident, the continuous draw-

bar became broken, there was nothing to retain it in its place underneath the car, the result being that it would "strip" out from each end of the car, leaving the car standing on the track with nothing whatever to draw it.

The proper application, it seems to me, of a continuous draw-bar would be to apply the strain so it was equally or nearly equally divided between both ends of the car, so that if you were to draw a car in a given direction the strain would be first applied to the rear end of the car. When the first movement was given, the strain should be slightly more at the rear end than at the forward end. When a car was well under way, then the strain should be equally or nearly equally divided between both ends of the car.

Also make the application to the car such that if the continuous draw-bar became broken through any accident it would not disable the car, but leave it as a direct draft.

I have noticed cars that are built by the Michigan Central and the Flint & Pere Marquette wherein the draft application seemed to me to be the nearest perfect of any application that has yet come under my observation. Those cars are built so that the draw-bar and draw-bar attachments are applied direct to the centre stringers of the car, and instead of having draft rigging or buffer arms attached underneath those stringers, the draft was direct. The buffing would be applied in the same way, only as a compression of the timbers.

By the application shown in your sketch it would indicate that when the strain is upon the cars the tendency would be to break or remove the camber in the car. The buffing would also have a tendency to relieve the strain of the camber rods, and when the reaction took place the load would increase the strain, so that by constant use the camber would be entirely lost.

I am informed by old and practical railway men that their opinions as to draft appliance are, that it should be attached to the centre stringers, and not by placing buffer arms underneath them.

I should like to hear from some others on this same subject.
C. E. MARK.

National Railroad of Nicaragua.

LEON, Nicaragua, April 1, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wish to call your attention to some facts gathered from the press and from complaints of the citizens of this country, which, for three years past, has suffered from the grossest mismanagement on the road built by the government and equipped with Yankee cars and engines. This road runs from Corinto, on the Pacific, to Momotombo, on the shore of Lake Managua, which is about 40 miles wide. From Corinto to Momotombo is 60 miles, with some 5 engines, perhaps 10 passenger and baggage cars and about 30 platform cars. On the eastern side of this lake is another division of 36 miles, from the city of Managua to Granada, on the bank of Lake Nicaragua, also built by the government and comprising all the railroad in this country. The eastern division is under the superintendence of Mr. Wm. Cooke, a very competent man, for many years with the late Henry Meigs in Peru and Chili. *El Diario* recently published, over the signatures of 30 of the leading merchants of the state, a protest against the administration of Señor Roman, setting forth the unbearable abuses and the imminent danger into which it has brought one of the most important national works, a work carried to completion under great sacrifices to the country. I give you some figures showing the expense in which he has involved the road: Thirty-two months repairing one engine, cost in wages, \$3,200; the invoice price of pieces imported and not needed, \$2,000, to which freight should be added; interest on above expenses and value of one locomotive thirty-two months in the shop, \$3,520; loss of service of the engine for thirty-two months at \$10 a day, \$8,140. The lignum vitae ties prematurely destroyed for want of proper ballasting and drainage, and which need to be replaced now, will number 40,000, and cost in position \$40,000; to properly ballast 30 miles of neglected track will cost \$30,000; to replace three bridges at \$4,000 each, \$12,000. Besides, by the neglect of his administration 32 miles of embankment and ditches have been so damaged by the rain as to require an expense of \$7,000 for their repair. Interruption of traffic for nearly two months may be put at \$20,000. The first trip made by the engine mentioned above, after having been thirty-two months repairing, was of nine miles, when she had to return to the shop with tubes leaking and a broken axle. The master mechanic of the road is a good blacksmith, but that is all. All the engines run hot; the crank-pins are black from heat, ground out by sand entering the brasses, which are played $\frac{1}{4}$ in. open, "to take up the lost motion." Men daily file the crank-pins—in fact it is probably from pure neglect the worst railroad in America. Columns might be written and still not do the subject justice. In the whole state there is but one man who can set a valve. On the western division the master mechanic goes to the Pacific Mail Steamship engineers when they are in port for advice. His last attempt was comical. He got $\frac{1}{2}$ lead on the right-hand side, and on the left-hand side he got lap instead of lead. Then the engine was taken down and set up on the eastern division, where she now hauls good loads. The whole thing is bungled, as is usually the case when a state tries to enter the transportation business. The present superintendent never before had anything to do about a railroad. The master mechanic is expected to be able to do everything—braze, solder, oil all journals, take out brake shoes, pack boxes, set up pumps, keep water tanks in order and repair hand cars when there were any on the road, keep the time and pay weekly.

Many of the merchants of the interior have returned to ox

carts to freight their goods, as no watchmen or lights were permitted by the superintendent at the stations, and the thieves had it all their own way. The country is fine, in fact I think the most desirable of all the Central American states. The people are kind and hospitable to strangers, and any one can succeed here if he avoids liquors. The railroad pays about 6 per cent. on its cost, and yet the rates of fare are but 1, 2 and 3 cents per mile, according to the class of cars. The climate is healthy, owing to the strong northeast trades. The thermometer in the shade ranges from 60 to 85 degrees. Some of the most beautiful landscapes are to be found here, and it is not to be wondered that Walker the filibuster was enchanted with the capacity of the country and the splendors of the scenery.

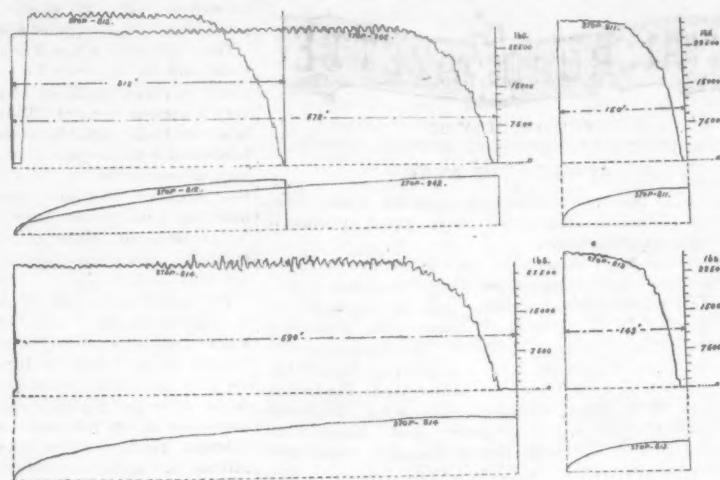
YANKEE.

Tight and Loose Couplings.

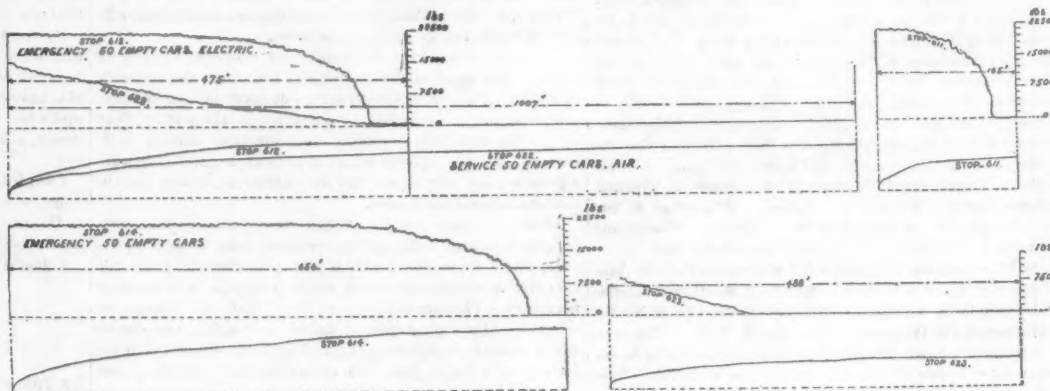
TO THE EDITOR OF THE RAILROAD GAZETTE:

If the advocates of loose couplings can find no better spokesman than your correspondent, Mr. C. E. Mark, they must be in a bad way and had better choose cemetery lots at once. A person who imagines that it would take 30 locomotives to compress a weak set of draw and buffing springs on 30 cars is certainly far too innocent for this wicked world and should seek a home above, where car couplers cease to trouble and car-builders are at rest.

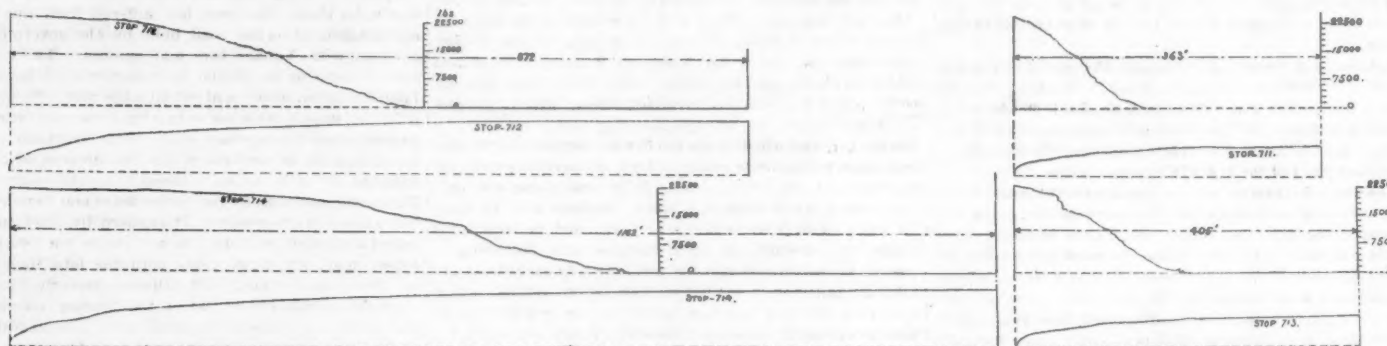
When a car is standing on a level track with the brakes off, and the journal boxes in fair order, any force applied against one draw-head to compress the spring will be transmitted to the other draw-head. If a car is standing against a buffer stop at the end of a side track and an engine pushes against the end of the car with a pressure of 18,000 lbs., is it not evident that that pressure will be communicated through the car and the buffing springs to the buffer stop? Precisely the same thing occurs with a train of cars. The push of the engine at one end is communicated from car to car, and reappears at the far end diminished only by the friction of the train and the friction of the draw gear working in the guides, etc. With cars in good condition this friction is very small. If Mr. C. E. Mark does not believe it, let him stand in front a train of 30 cars and have an engine at



Carpenter Brake.



Westinghouse Brake.



Eames Brake.

BRAKE BEAM PRESSURE DIAGRAMS.

712, Eames emergency stop, 50 empty cars, air, level, 19 1/4 in. movement slidometer; 714, Eames emergency stop, 50 empty cars, air, 53 ft. grade, 20 1/4 in. movement slidometer; 711, Eames emergency stop, 50 empty cars, air, level, 20 in. movement slidometer; 713, Eames emergency stop, 50 empty cars, air, level, 22 in. movement slidometer; 612, Westinghouse emergency stop, 50 empty cars, electric, level, 53 ft. grade, no shock; 611, Westinghouse emergency stop, 50 empty cars, electric, no shock; 623, Westinghouse emergency stop, 50 empty cars, electric, no shock; 812, Carpenter emergency stop, 50 empty cars, electric, level, no shock; 842, Carpenter emergency, 33 loaded, 17 empty cars, electric, level, no shock; 814, Carpenter emergency, 50 empty cars, electric, 53 ft. grade, no shock; 811, Carpenter emergency, 50 empty cars, electric, level, no shock; 813, Carpenter emergency, 50 empty cars, electric, 53 ft. grade, no shock.

the far end shove the cars towards him. He will find that one locomotive has plenty of power left to hurt a man even after compressing the draw springs of 30 cars.

As an old railroad man, let me advise Mr. Mark to study actual facts on this question, and he will find that, contrary to his supposition, an engine will start and haul a heavier train without loose slack than with it. The experiments that have shown this are worth more than any amount of fallacious reasoning on this point.

D.

The Burlington Brake Tests.

BRAKE BEAM PRESSURE DIAGRAMS.

The accompanying illustrations represent the diagrams of brake beam pressures obtained from the middle car of the test trains of 50 cars. The diagrams are exceedingly interesting as showing the pressure on the brake shoes at any moment of the stop, and the gradual reduction of speed caused by that pressure.

The method by which these diagrams are obtained was explained at length in these columns in our account of the freight train brake trials held at Burlington last year. It may, however, be briefly stated that on one truck of the middle car the brake works as on every other car in the train. On the other truck, the brake pull-rod, instead of being connected with the truck brake lever, pulls against a powerful spring. The tension on this spring, and consequently the pressure exerted on the brake beam, is measured and recorded on a sheet of paper made to travel by means of gearing driven from the truck wheels. As these wheels have no shoes applied to them, they cannot be skidded, and can, therefore, furnish an accurate record of the distance run.

The lower line below the brake beam pressure diagram shows the speed at each instant of the stop. This line is drawn by a Boyer speed recorder made by the Boyer Speed

Recorder Co., of St. Louis. One of these instruments is also placed on each engine, and they are found after careful checks of various kinds to give very accurate results.

It is, of course, obvious that the results obtained as to speed, distance run, and pressure on brake shoes are useless unless accurate; but as far as possible, every effort appears to have been taken to obtain trustworthy results. The great resources of a large and progressive railroad, and the services of a picked staff of skilled engineers and electricians from various parts of the country, have rendered it possible to make these trials the most exhaustive and probably the most accurate yet held. The American Brake Co. has given considerable assistance by devising speed recorders and other instruments with which to ascertain the bottom facts in the brake question.

The lower diagram (vertical scale, 1/4 in. = 30 miles per hour; horizontal scale, 1 in. = 200 ft.) of each pair shows the speed of the train. The vertical scale shows the pounds pressure on all shoes of one car. The figure between dimension lines corresponds to distance run after the application of brakes to engine. The vertical line at the commencement of the diagram shows the time of applying the brakes, diagrams reading from right to left.

It will be seen that generally, when the valves are operated by electricity, the pressure commences to rise almost immediately, and that when the valves are operated by air or vacuum the train runs for a considerable distance before there is any pressure to force the shoes against the wheels.

The diagrams are incomplete, because at the date they were taken the run made by the Eames brake with electric application had been marred by several mishaps caused by faulty installation of the electric apparatus, etc., and therefore any fair comparison between the applications by air and electricity was impossible. When the diagrams were taken neither the Eames nor Westinghouse had been tried with

BRAKE BEAM PRESSURES—PARTICULARS OF STOPS.

No.	Speed miles per hour.	Actual distance, ft.	Distance corrected for speed,* ft.	Time, seconds.	
612	37	475	554	14 1/4	Westinghouse.
622	35 1/4	1,007	1,315	27 3/4	Westinghouse.
614	42	965	539	16	Westinghouse.
611	20 1/4	155	143	7	Westinghouse.
712	38	894	999	22 1/4	Eames.
714	41	1,167	1,111	30 1/4	Eames.
711	21 1/4	366	317	17 1/4	Eames.
713	21	405	385	18 1/4	Eames.
812	34	324	448	10	Carpenter.
842	35	572	747	19 1/4	Carpenter.
814	41	597	568	17 3/4	Carpenter.
811	22	153	128	6 1/4	Carpenter.
813	21 1/4	141	122	7 1/4	Carpenter.

* NOTE.—Stops made at about 20 miles per hour are corrected for 20 miles per hour. Stops made at about 30 or 40 miles per hour are corrected for 40 miles.

mixed trains of 33 loaded and 17 empty cars. Many interesting comparisons may, however, be made.

The stops 612 and 622 may be compared. Both stops were made with the same train and at the same stop post—No. 2 on a practically level grade. Stop No. 612 was, however, an emergency stop, the valves being operated by electricity, and 622 was a service stop, the valves being operated by air. The effect of electricity in abolishing shocks is forcibly shown by these stops. In the electrical emergency stop, there was no shock in the rear car, and merely a slight elastic surge of the train was felt in the front car, while in the service stop, effected in more than double the distance, though the speed was lower, the shock was sufficient to move the slidometer 11 1/4 in.

The service stop diagram shows that on the middle car the brakes did not begin to apply till the train had run some 500 feet, and then went on very gradually, the pressure on the brake shoes increasing till the train came to a stand. When the train had run 500 feet, half the length of the stop, the

speed had been reduced from 35½ to 30 miles an hour, solely by the action of the brakes on the engine and on the front portion of the train, the brakes on the rear portion not having begun to apply. This, to a great extent, explains the movement of the slidometer. The contrast between the slow and gradual application of pressure in the service stop, the valves being operated by air, and the quick rise of pressure when the air is let out of the train pipe at three places by an electric valve placed in the couplings is very marked. The ideal service stop would be a moderate pressure quickly applied, and gradually decreased towards the end of the stop. Further trials will possibly show whether this can be obtained.

The stop 942 was made with the Carpenter brake with a mixed train, all the other stops illustrated having been made with trains of empty cars. It may, however, be compared with the stop 812 made with the same brake, and at the same stop post (No. 2 on the level) but with an empty train. The braking power was in each case nearly identical, being, of course, proportioned to the weight of the empty cars. The greater weight, and consequent momentum, however, of the 33 loaded cars, propelled the train a considerably greater distance. In the stop with the empty train the brake beam pressure was about 30,000 lbs., or about 110 per cent. of the weight of the empty car. In the mixed train stop 942, the brake beam pressure was 25,500 lbs., or somewhat less than the weight of the car.

In stop 812 the diagram shows that the brake was released somewhat prematurely, apparently about 18 ft. before the middle car had come to an absolute stand. The effect of this in lengthening the stop can be seen in the lower diagram, showing the reduction of speed. At the end of the stop, it will be noticed that the speed line in 812 does not descend as rapidly as that in 842. The engineer working the Carpenter brake, probably from force of habit, followed a generally good practice in releasing just before he came to a stand, and it is interesting to note that, by means of these diagrams, we are able to ascertain these and many other little details of the manipulation of the brake. It may be explained that the Carpenter brake being released by electricity, the release is as instantaneous as the application, and, according to this diagram, the release took place in about one second. The train was running at a mean speed of nearly 7 miles per hour, or 10 feet per second, while the release took place, and scaling the diagram shows that the release took place while the train traveled 10 feet. The pressure line of the diagram rising again further shows that, realizing that he had released the brakes too soon, the engineer reapplied the brakes just as the train came to a stand.

The diagrams for 812 and 922 show that the pressure on the brake shoes began after the train had run about 4 ft. past the stop post, or point where the signal is given and the diagram is started, and the engineer's valve on the engine is moved to apply the brakes. As the train was running 54 ft. per second in one case and over 51 ft. per second in the other, it would appear that the brakes began to apply in about ⅓ of a second. The full pressure was obtained when the train had run 100 and 112 ft. respectively, or in rather over two seconds after passing the stop post.

The stop 814 shows that the brakes began to apply after the train had run 25 feet, the train then running at 39½ miles per hour, or 58 ft. per second. The brake, therefore, began to go on in rather less than ⅓ second. The full pressure was attained when the train had run 125 ft., or in a little less than 2½ seconds after passing the stop post. The difference between this and the preceding stops suggests that in the former case the brakes were prematurely applied by a fraction of a second.

The diagrams obtained from the Eames brakes are undoubtedly correct as regards the time at which the pressure began to show, but it is possible that the amount of pressure shown may be incorrect. As both the leverage and the effective area of the diaphragm largely depend upon the amount of slack between the shoes and the wheels, it is evident that unless the apparatus under the middle car was so arranged as to represent the average slack of the shoes throughout the train, the pressure shown in the diagram would not represent the average pressures obtained in the rest of the cars composing the train. Every care has been taken to obtain accurate results, but this warning is perhaps necessary.

In our next issue, further and later diagrams will be given, but it may be mentioned that the accompanying diagram fairly represent the characteristics of those taken later.

The Burlington Brake Tests.

In the following résumé of these tests we have grouped as heretofore the various tests, and given average results. The stops have been corrected to speeds of 20 or 40 miles an hour, as the case might be.

Continuous brakes, 33 loaded cars and 17 empty. Brake-shoes about half an inch from wheels. Corrected to 20 and 40 miles an hour. Stops in feet.

	20 miles.	40 miles.
Westinghouse	202	927
Carpenter	247	1,385
Eames	463	1,651

Eames used air only, the current not being strong enough, although the dynamo was running full speed. The small size of the train pipe in the Carpenter prevented the reservoir being fully recharged after the first stop, so that the pressure in the cylinder of the last car at the last stop was but 18 pounds per square inch, which accounts for the poor performance.

The results of general test No. 4 down 53 ft. grade, pass-

ing post No. 3 at 20 miles an hour, speed to be reduced to 15 miles an hour and held there, were as follows:

	Speed passing post 3. Miles per hour.	Time taken to reduce speed. Seconds.	Speed held down grade. Miles.	Speed at distance post. Miles.	Time from start at distance post.
Carpenter:					
First run ..	20	180	13 to 17	14	420
Second " ..	21.25	120	14.5 to 16	15	425
Third " ..	21	120	11.5 to 15	13.5	458
Eames:					
First run ..	20	60	15 to 17	15	421.5
Second " ..	22.5	60	15 to 16.5	16	431.5
Third " ..	22.5	180*	14½ to 24½	15	325
Westinghouse:					
First run ..	22.5	180*	14½ to 24½	15	325
Second " ..	22.5	180*	14½ to 24½	15	340.5
Third " ..	22.5	180*	14½ to 24½	15	340.5

* Increased to 31 in two minutes, then reduced. † Increased to 27½ miles in 90 seconds, decreased to 16 and increased to 21.

In this last run the graduation was by air only, and the average speed was too high. Eames was about right. The distance between posts is about two miles, and the time, at 15 miles an hour, should be rather less than eight minutes, allowing for higher speed when entering the run.

Since our last issue, the Card Electric and the Hanscom Air brakes have withdrawn, leaving on the ground only the Carpenter, Eames and Westinghouse brake trains. The American brake train is not yet ready, and the Erie cars on which the Rote brake is to be fitted are still in an early stage of construction at Hegewisch, waiting the advent of those useful members of society known as blacksmiths. The Wedgfield & Button brake is stated to have undergone a series of unpromising private tests on the Lehigh Valley, but it seems doubtful whether it will participate in the trials at Burlington, which, as far as the brakes on the ground are concerned, are nearly over.

The results with trains of 50 empty cars may be briefly summarized as follows, the distances being corrected for speed, but no allowances being made for grades and other minor disturbing influences:

	Stops in feet.	Speed in miles per hour.			
	Electric.	Air or vacuum.		Driver and hand.	
		20	40	20	40
Speed	20				
Carpenter ..	154	507			
Westinghouse ..	155	578	219	732	
Eames ..	201	690	342	1,036	
Card ..	432	1,028			
Hanscom ..			933	3,900	
Armstrong ..				939	3,473

Both the Westinghouse and Eames brakes have since done relatively better with mixed trains. The Card electric brake is quite new, and apparently had not previously made an emergency stop with a train of 50 cars. The poor performance of this brake was greatly due to mechanical rather than electrical defects in the brake, and a lack of experience as to the proper amount of electromotive force to be employed. The foundation brake rigging is weak, and the chains driving the friction clutches which are made to engage by the passage of the electric current have been repeatedly broken. As these defects could not be remedied without virtual reconstruction, the Card brake has been withdrawn from further participation in the trials.

Mr. Hanscom has also withdrawn his brake, and states that he intends to add an electrical attachment and effect other improvements, when he will again bring the brake before the public. The very poor stops made appear to be due to the extremely slow action of the brake, which took about 1 minute 32 seconds to go on the rear car. The hose were leaky and badly secured, retarding the action of the brake.

The brake is also poorly designed, the use of two lines of pipe and hose being an unnecessary complication.

Subject, however, to the above considerations, the table gives roughly but fairly a good general idea of the relative power of the different brakes to stop a train of 50 empty freight cars in the shortest possible distance. It will be seen that the best forms of brakes, with valves operated by electricity, can stop a train in about one-seventh to one-sixth of the distance required by hand brakes. The hand brakes undoubtedly made the best showing possible, the crew being composed of picked men, all on the alert and working in daylight, with brakes in better order and with far less slack than is usual with hand brakes. On one occasion, one brakeman set seven brakes, and another eight. This is pretty smart work, and could not be obtained under adverse conditions.

The following table shows the average distance in which the trains of 33 loaded and 17 empty cars were stopped:

Method of application.....	Electric.		Air.	
Speed, miles per hour	20	40	20	40
	Ft.	Ft.	Ft.	Ft.
Carpenter r.....	172	873	..	..
Westinghouse.....	200	876	..	..
Eames.....	203	1,032	446	1,486

The Carpenter brake as at present fitted is not intended to be worked by air, and the terrific shocks experienced when working the empty Westinghouse train with air alone have hitherto prevented any stops with mixed trains without the use of electricity. Mr. George Westinghouse has, however, arrived on the ground, and is sanguine that some alteration in the size of the passages in his new triple valve will prevent or greatly mitigate the shocks. At present, however, only the Eames brake has stopped mixed trains of 50 cars without electricity. The shocks were within the limit considered permissible, varying from 4½ in. to 7½ in., but the average distance run at the 20-mile per hour stops was nearly three times that given by the use of electricity in the Carpenter loose-coupled train, stopped without any movement of the slidometer. The Eames train is fitted with the Boston automatic coupler, with wedges to take up the slack.

It will be observed that relatively the stops made by the Carpenter brake at the 40 mile speeds are not as good as those made at the 20 mile speeds. The reason of this appears from the pressure diagrams and records to lie in the fact that the ½ in. diameter train pipe employed is not sufficiently large to fully recharge the reservoirs in the rear of the train when several stops are made in quick succession. Consequently when the last stop on the grade at 40 or 30 miles per hour is made, the pressure of the cylinders at the rear end of the train is insufficient to do good braking. This defect could easily be remedied by using a large train pipe, and it is of course unlikely that in ordinary practice four emergency stops would be made in rapid succession.

The Eames, Westinghouse and Carpenter brakes have been tested with all the shoes at least ⅓ in. from the wheels. As might be expected, the performances of the latter brakes are little affected.

The Eames, Westinghouse and Carpenter brakes have been severely tested as to their powers of graduation. The train is required to shut off steam at stop post No. 3 (situated just below the summit of the grade) and reduce speed from 20 to 15 miles per hour, and continue that speed down the 53 ft. grade until the distance post is reached, a distance of about 2 miles.

The Carpenter brake was the first to be subjected to this test, and made three runs with great success, the graduation being all that could be desired. The speed in the first test was 20 miles per hour when passing the first stop post. It was soon reduced to 15 miles per hour and varied from 13 to 17 miles all down the grade, the speed to the eye appearing perfectly uniform. On the next test the speed at No. 3 post was 21½ miles per hour, this was reduced to 14½ miles per hour, and never fell below this or rose above 16 miles per hour during the re-

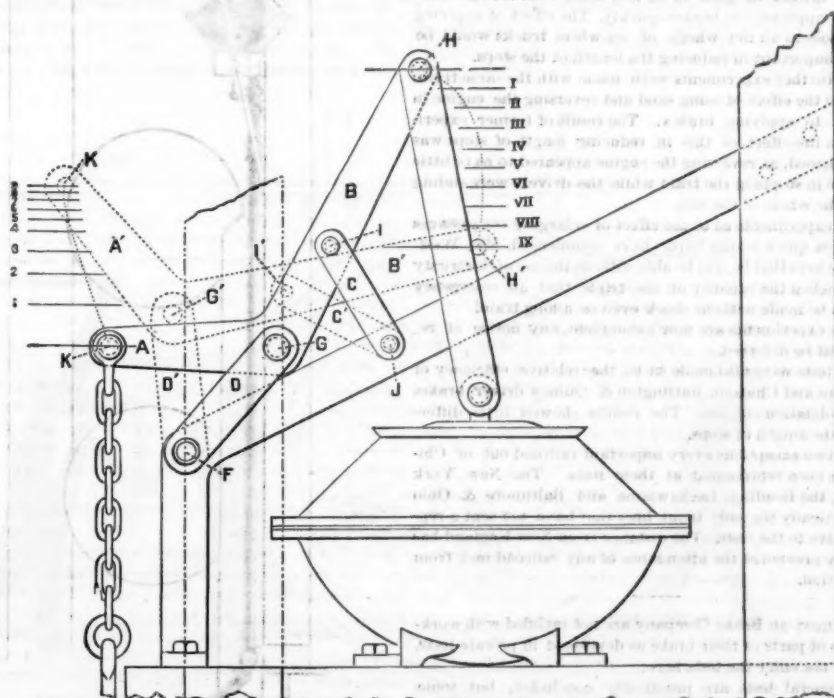


Fig. 1.—Eames Brake, Floating Fulcrum Lever.

mainder of the run. The train pipe pressure varied from 82 to 89 lbs. In the third test, the speed of 21 miles per hour in passing the post was reduced to 11½ and then rose to 15, at which it was kept steady during the rest of the stop. The graduation was made wholly by electricity, a slight touch of the engineer's valve sufficing to apply the brakes gently.

The Westinghouse brake, at the first test, was stopped after running 3,080 ft., by the breakage of a key in a temporary draw-bar, placed in the 30th car from the engine, in order to replace a Janney broken in an air emergency stop. On the second test the speed varied from 14½ to 24½ miles per hour, and on the third from 8½ to 22½ miles per hour. The train was graduated by air only.

The Eames train also came to a premature stand at the first test, the pressure on the engine (120 lbs.) being insufficient to release the brakes. The larger portion of the train had to be bled before a start could be made. The second and third tests were very successful, the speed being very even.

Some interesting trials were made Wednesday with a train of 25 empty Chicago, Burlington & Quincy box cars taken out of service and fitted with regular Westinghouse freight brake and Potter draw-bars. The stroke of the pistons averaged about 8 in., and the shoes inside hung, with Westinghouse iron brake beams were somewhat oily and irregularly worn. The stops given would therefore represent fairly those attainable in ordinary service, and may be compared with stops made with the train of new Pennsylvania cars fitted with the latest form of Westinghouse brake specially for the test. The train was not prepared in any way for competition, except that slack of shoes was taken up on a few cars with 10 in. stroke of piston and marked to shops for repairs. The engines had 17 x 24 cylinders, 61-in. drivers on the tread, and weighed practically the same as the engines used in the regular tests. The average results corrected for speed were as follows: 20 miles per hour, 284 feet; 40 miles per hour, 800 feet. The dynamometer car and the way car, both without brakes, were attached to the train. The average movement of the slidometer was 17½ in., being above the permissible limits. This would be reduced considerably were a close coupler used.

In order to ascertain in what distance an average passenger train can be stopped, some experiments were made with a train of 8 passenger cars. These cars were of an obsolete pattern and were equipped with triple valves with cast-iron cases, but external release springs. The main train pipe was three-quarters inch bore, while that on the freight trains is 1 in. bore. The dynamometer car and way car, both without brakes, were attached to the train. It was estimated that as regards weight the train would represent a train composed of 2 baggage and express, 2 passenger and 4 Pullman cars in ordinary running order and not specially oiled and prepared for trial. Corrected for a speed of 40 miles per hour, the average distance in which train was stopped was 956 feet. Four stops were made in succession over the regular course, and it was noticeable that the first stop was the best—846 feet corrected for 40 miles per hour. After this, the stops increased in length, the last being 1,101 feet. This was probably due to a fall of pressure in the train pipe from 68 pounds at the first stop to 55 at the last. In an emergency stop in ordinary practice the higher pressure is more likely to be obtained, and therefore it may be taken that when running at 40 miles per hour an ordinary passenger train not in special order or fitted with the latest appliances can be stopped in about 900 ft. When running 50 miles per hour, the distance would be about 1,350 ft., and at 60 miles per hour, somewhat under 2,000 ft.

The difference between these figures and those attained with the 50-car freight car trains shows the importance of keeping brakes in good order and fitted with the latest devices for applying the brakes quickly. The effect of applying brake shoes to all the wheels of six-wheel trucks would be equally important in reducing the length of the stops.

Some further experiments were made with the same train, and as to the effect of using sand and reversing the engine in addition to applying brakes. The result of former experiments on the effect of this in reducing length of stops was not confirmed, as reversing the engine appeared to have little influence in stopping the train while the drivers were sliding nearly the whole of the stop.

Some experiments as to the effect of enlarging the passages of the new quick acting triple have commenced. Mr. Westinghouse says that he will be able without the use of electricity to so quicken the rapidity of the triple that an emergency stop can be made without shock even on a long train.

As the experiments are now incomplete, any notice of results must be deferred.

Some tests were also made as to the relative efficiency of American and Chicago, Burlington & Quincy driver brakes on Consolidation engines. The results showed little difference in the length of stops.

With two exceptions every important railroad out of Chicago has been represented at these tests. The New York Central, the Reading, Lackawanna and Baltimore & Ohio are practically the only trunk lines that have not sent a representative to the tests. The distance from New England has probably prevented the attendance of any railroad men from that section.

The American Brake Company are not satisfied with workmanship of parts of their brake as developed in private tests, and will not enter the tests here.

The general tests are practically concluded, but some special tests of the Westinghouse were made Wednesday and Thursday with improved triple valves and apparatus for

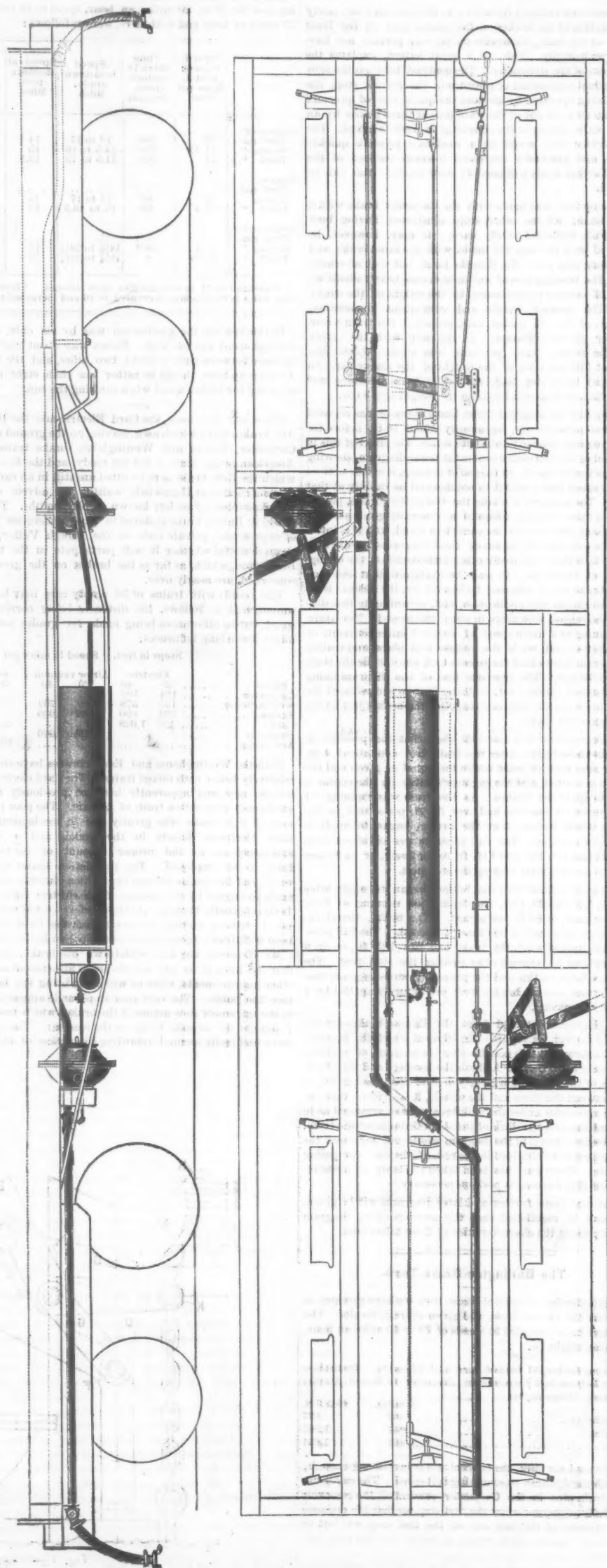


Fig. 2.—Eames Brake, Plan and Elevation of Apparatus on Car.

diminishing the pressure in the driver brake cylinder when the wheels threaten to slide; and also passenger train tests showing improvement effected by the latest form of triple valve and engineers' valve.

Carpenter will also make some special tests to show the capability of working with the Westinghouse and ability to make better stops on grades if allowed time to get full pressure on all parts of train.

EAMES.

It was said in the *Gazette* last week that a diaphragm failed on the Eames train. In fact, it was part of the foundation brake rigging that broke.

COMMITTEE ON ELECTRICAL APPLIANCES.

The committee in charge of the tests have appointed a special committee to report to them on the electrical appliances. It consists of Mr. E. M. Herr, Superintendent of Telegraph of the Chicago, Burlington & Quincy, A. H. Bowman, Electrician of the Lehigh Valley, and O. E. Stewart, Division Superintendent of the Chicago, Burlington & Quincy, formerly Superintendent of Telegraph of same road. The committee began its investigations Thursday, May 10.

VISITORS.

John Player, Master Mechanic, Central Iowa; R. W. Bayley, Pan Handle; W. A. Thompson, Assistant Superintendent Marquette, Houghton & Ontonagon; George Gibbs, Engineer of Tests, Chicago, Milwaukee & St. Paul; E. N. Armstrong, General Superintendent Toledo, Peoria & Western; George Westinghouse, Jr., W. W. Card, John Caldwell, H. H. Westinghouse, T. W. Welsh and Frank Moore, of the Westinghouse Brake Co.; J. F. Carpenter and H. Hollerith, of the Carpenter Brake Co.; Albert Massey and J. Casey, of the Eames Brake Co.; R. M. Agnew, of the Rote Brake Co.; H. Poor and others, of the American Brake Co.; Messrs. Card and Franklin, of the Card Brake Co.; W. W. Hanscom, Hanscom Brake; H. C. Buboup, of the Janney Coupler; H. Kendall, of the Boston Automatic Coupler; R. W. Perry; J. Stockler, J. Boyer, of the Speed Indicator Co.; A. Vogt, Mechanical Engineer, Pennsylvania Railroad; J. E. Sague, Engineer of Tests, New York, Lake Erie & Western; N. J. Paradise, Master Mechanic, Hannibal & St. Joseph; C. A. Schroyer, Asst. Superintendent Motive Power, Chicago & Northwestern; Geo. H. Harris and W. Dean, Pittsburgh, Cincinnati & St. Louis; J. D. Besler, Superintendent, R. W. Colville, Division Master Mechanic, and Mr. Kidder, of the Chicago, Burlington & Quincy; James Howard, Beals' Driver Brake, and others have been here during the whole or part of the tests.

The Eames Automatic Vacuum Freight-Brake.

The Eames automatic vacuum freight-brake consists of an injector, placed upon the engine, and a reservoir, automatic valve and two brake diaphragms under each car. A vacuum is maintained in the train pipe and reservoir by the ejector, and the brakes are applied when this vacuum is reduced in the train pipe either by the engineer or by the parting of the train.

THE EJECTOR.

The ejector has two jets, the larger being to produce the required vacuum in the train pipe and reservoirs, and the smaller to maintain the vacuum against leakage, if any, in the apparatus. The larger jet is employed only when the immediate creation or restoration of the vacuum is necessary in charging the train or releasing the brakes. The smaller jet, having a diameter of $\frac{1}{8}$ in., is used continuously, except when the brakes are applied.

THE FLOATING FULCRUM LEVER.

Fig. 1 shows an arrangement for automatically adapting the braking power to the weight of the car and load. The diaphragm washer may be connected directly with the brake-levers, giving a leverage and braking power proportional to the weight of the car whether light or loaded. A certain percentage of the weight of the empty car cannot be exceeded without skidding the wheels, when the car is empty, while a very much greater power may be applied to

the loaded car without skidding. It is claimed that this device furnishes the proper amount of braking power for empty cars, and increases it proportionally as the car is loaded.

The brakes being hung from the body of the car, the slack of the shoes is greater when the car is loaded, because the shoes are hung below the centre of the wheels, and retreat from the wheels as the load compresses the springs. The device shown in Fig. 1 can be adjusted to increase the pressure

on the shoes 50 to 100 per cent. by this variation in the slack.

The lever *AB* is suspended by the links *C* and *D*, which are attached to a rigid support at *F* and *J*. The diaphragm, placed in any convenient position, is connected to the lever at *H*; the brake rod is connected to the lever at *K*. When the diaphragm is collapsed by exhausting the air from its interior, it draws the lever toward it, the point *H* traveling over the path *H-H'*. At the same time the point *K* travels

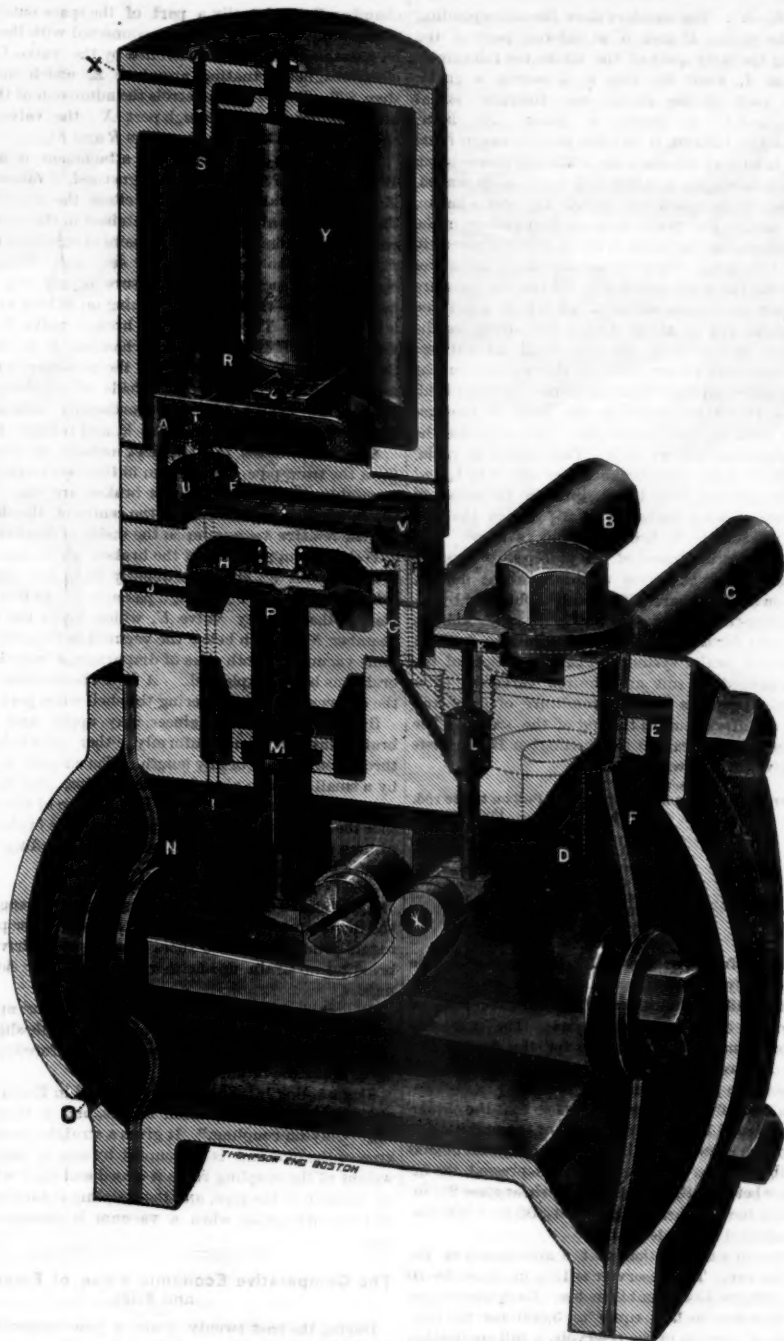


Fig. 3.—Eames Electric Valve.

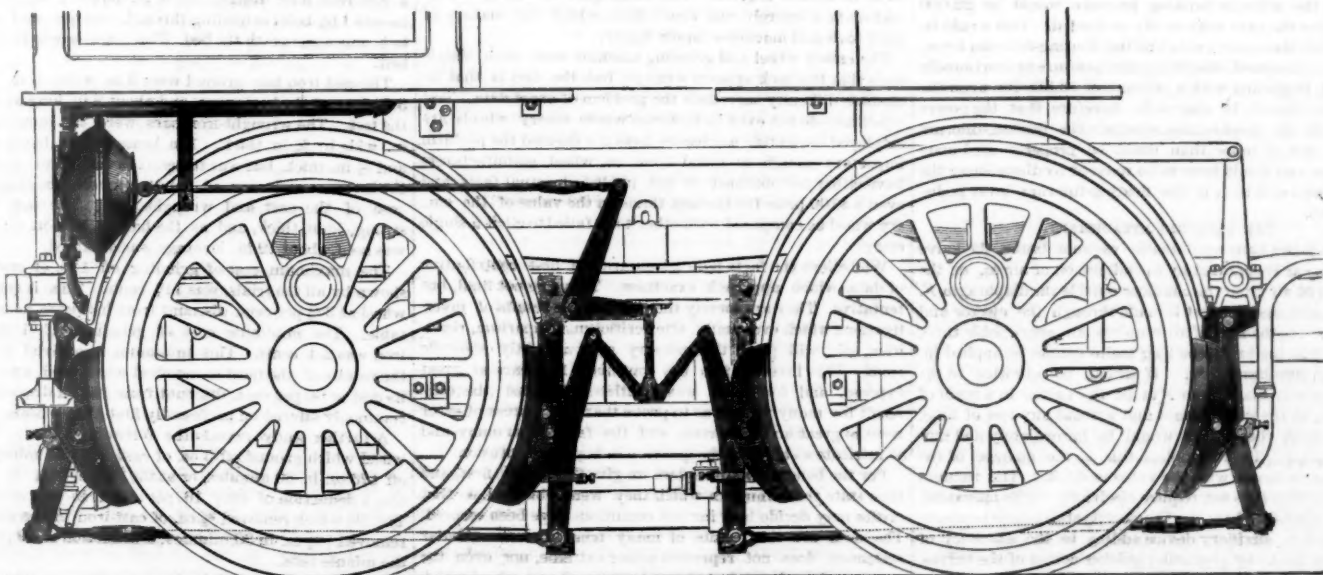


Fig. 4.—Eames Driver Brake.

EAMES AUTOMATIC VACUUM FREIGHT BRAKE.

over the path $K-K'$. The numbers show the corresponding positions of the points H and K at different parts of the stroke. During the early part of the stroke the fulcrum of the lever is at I , while the link D is merely a guide. In the latter part of the stroke the fulcrum is at G' , and the link C' is merely a guide. At intermediate points the fulcrum is at some point between I and G' . Hence, in taking up the slack the brake rod moves much faster than the diaphragm, and but little force is expended, while when the blocks reach the wheels the stress has increased very much. The spaces between the numbers in the path $K-K'$ indicate the variation in force, which is inversely as the distance traveled. When the cars are empty the brakes get home at about the point marked 3. When the cars are loaded the brakes get home at about 6, at which point the stress on the brake rod is about double the stress on the empty car. The cars used in the test weigh 24,000 lbs. empty. Assuming that 70 per cent. of the weight on the wheels is the greatest pressure that can be used without skidding the wheels, 16,800 lbs. would be the limit of pressure that could be used on the empty car. When loaded the springs are compressed half an inch. This causes a variation in the slack of $\frac{1}{4}$ in. The brake levers are 5 to 1, and the travel of the pull rod 10 to 1; therefore a variation of $\frac{1}{4}$ in. in the slack makes a variation of $2\frac{1}{2}$ in. in the distance the pull rod travels to bring the blocks home. The variation of $2\frac{1}{2}$ in. in the travel of the pull rod brings the lever in a position where the stress would be about double, or 33,600 lbs. on a loaded car. This result is obtained by inserting the floating-fulcrum lever in the pull rod. Though designed especially for the Eames brake, it can be used in any hand or power brake system. The proportion of the parts can be arranged to suit any desired variation, or to take up the slack with a slight expenditure of force and then maintain a uniform pull to the end of the stroke. The arrangement used in the train at the Burlington Brake Tests is claimed to give the following results:

Stroke of diaphragm. Inches.	Direct pull of No. 3 diaphragm. Pounds.	Pull on brake rod. Pounds.
1	1,400	750
2	1,700	780
3	1,120	870
4	1,080	1,100
5	1,070	1,550
6	940	1,900
7	850	1,800
8	740	....
9	550	....

It will be noticed from the above table that the pull on the diaphragm gradually decreases as the stroke increases. This is caused by the gradual diminution of the effective area of the diaphragm as it bottoms on the case. The increasing leverage, however, more than makes up for the decrease of area until the diaphragm has traveled about $6\frac{1}{2}$ in., when the pull on the brake pull rod begins to diminish.

It is claimed that if the slack is adjusted so that the brake shoes get home with 3 in. to $3\frac{1}{2}$ in. travel of the pull rod for the empty cars, the stress on the brake pull rod would be 800 lbs. to 1,000 lbs. When the springs are depressed the increased distance between the wheels and the shoes gives $2\frac{1}{2}$ in. further travel of the diaphragm, giving 1,800 to 1,900 lbs. pull on the brake rod for loaded cars.

Fig. 2 shows plan and elevation of the attachment of the apparatus to the car. The reservoir is $15\frac{1}{2}$ in. diam. by 70 in. long and contains 13,600 cubic inches. Each diaphragm contains 1,750 cubic inches, equal to 3,500 for the two. With 20 inches of vacuum in the reservoir, a full application of the brakes gives $13\frac{1}{2}$ in. vacuum in the diaphragms, equivalent to $6\frac{1}{2}$ lbs. pressure upon each square inch of effective diaphragm area, or an average pull upon each diaphragm washer of 1,100 lbs. This pull is multiplied by the floating-fulcrum lever already described, and is arranged to yield a braking pressure of 16,800 lbs. upon the shoes of the empty cars, and 33,600 lbs. upon the shoes of the loaded cars.

The short arm of the brake-lever is 7 in. and the long arm 28 in., giving a ratio of 5 to 1. If the diaphragm pulled directly upon the brake-rod, and the shoes were hung from the truck, the average braking pressure would be 22,000 lbs., whether the cars were empty or loaded. This would be excessive for the empty cars; but the floating-fulcrum lever, as has been explained, distributes this pressure proportionally to the load, beginning with a pressure of 16,800 lbs. upon the empty car. It will be observed, therefore, that the power furnished by the diaphragms, whether the floating-fulcrum be used or not, is more than could be properly used upon empty cars, and would have to be reduced by diminishing the leverage ratio of 5 to 1, if the floating-fulcrum lever is dispensed with.

THE ELECTRIC ATTACHMENT.

As used in the Eames automatic vacuum brake, the valve under each car is operated by the admission of air to, or the exhaustion of air from the chamber outside the diaphragm F . This admission and exhaust is made through the ejector and train pipe. As the flow of air requires an appreciable time, it follows that the brakes on long trains cannot be applied instantly and simultaneously. If air can be admitted to the chamber outside diaphragm F in all the valves in a train of any length, at the same instant and without any loss of time, it follows that the brakes would be immediately and uniformly applied. To accomplish this is the purpose of the electric device shown with the valve in fig. 3. The vacuum brake, however, does not require electricity for its operation, but may be used without it. The electric attachment is simply an independent, auxiliary device adding to the efficiency of the vacuum brake by producing quicker action of the valves. This consists of a shell, which is fastened to the main valve with bolts, and contains two chambers R and F' . Chamber F' is connected with the space outside of diaphragm F by the passage of $F'V$. This passage is always open; consequently

chamber F' is virtually a part of the space outside of diaphragm F . Chamber F' is also connected with the train pipe by passage W , which is controlled by the valve V . Y is an electromagnet actuating armature Z , which moves valve stem ST . The valve S controls the admission of the external air to the chamber R through port X ; the valve T controls communication between chambers R and F' .

The operation of this electric attachment is as follows: When the electromagnet Y is magnetized, it raises armature Z , which opens the valve T , and closes the valves S and V . This allows the air which was contained in the chamber R to pass through chamber F' to the chamber outside of diaphragm F , actuating the valve as already described. The capacity of chamber R is such that one measure of air will apply the brakes lightly—the brakes remaining on as long as the circuit is kept closed. The circuit being broken, valve T closes, and valves S and V open, allowing chamber R to fill with air through port X . A repetition of the movement puts another measure of air into the space outside of diaphragm F , and applies the brakes with proportionally increased force. Breaking the circuit opens valve V , and releases the brakes.

As valve V closes the chamber outside of diaphragm F from the train pipe, the vacuum in the reservoir may be increased by the ejector while the brakes are on. To prevent the exhaustion of the air from the centre of the shell increasing the relative vacuum upon the inside of diaphragm F and affecting the application of the brakes, air is also exhausted from chamber F' , and consequently from the chamber outside of diaphragm F , through passage I . In this passage is placed the gravity valve U , which keeps the vacuum in chamber F' one inch below the vacuum in the reservoir. The same vacuum on both sides of diaphragm F would release the brakes as before explained. A is a check-valve to prevent the external air from entering the shell when port X is open.

By this device the engineer may apply and release the brakes instantly and uniformly, either in whole or part, throughout a train of any length. The current is generated by a small dynamo placed on the engine, and is used only when the brakes are applied. By the use of this electric device the reservoirs can be charged while the brake is on, furnishing a continual supply of power for retarding trains upon grades.

THE DRIVER-BRAKE.

Fig. 4 shows the driver-brake used upon the engine used at the Burlington brake trials. A bell-crank lever pulling on a toggle joint forces two shoes against each driving wheel, bringing no strain upon either the journal or side-rod bearings.

The engineer's valve is manipulated for applying the brakes by electricity by revolving the handle slightly. One turn applies the brake gently, two more forcibly, and four turns apply the brake fully.

The coupling is that generally adopted in England for both automatic and non-automatic brakes, and is there known as the "Clayton coupling." It gives a straight passage the full area of the pipe and is unoccupied by simply lifting it. The weight of the coupling keeps it closed and tight when there is no vacuum in the pipe, and the coupling is further tightened and drawn together when a vacuum is created in the train pipe.

The Comparative Economic Value of Emery Wheels and Files.

During the past twenty years a new industry has been created in the development of grinding processes and of the solid emery wheel. It is manifest that this industry would not have grown unless the common sense test of practical use had stamped it a success. But the remarkable fact is, that while most mechanical industries have been based on exact data, this has lacked such data, and has been founded on generalities. Each emery wheel maker has been loud in praise of his own wheel, and all have united in the broad, general claim that the solid emery wheel was a great labor-saving tool. If asked how long a wheel will last, what it will do, what is its profit and loss account as compared with other tools, no answer is given. The catalogues of emery wheel-makers lack entirely the exact data which the makers of most tools and machines supply freely.

The emery wheel and grinding machine seem such simple tools that this lack appears strange; but the fact is that incredible difficulty surrounds the problem of exact data. Test conditions do not exist in factories where emery wheels are employed—scientific mechanics have not deemed the problem important enough to spend time on, wheel manufacturers have either not obtained or not published actual facts, and even a \$100 prize for the best thesis on the value of the emery wheel as compared with other tools failed to elicit a single essay.

We believe the facts here given are the first contribution of data which approach exactness. They are not final, but tentative. They are merely the first reliable results of investigations which eventually, after criticism, comparison, repetition, etc., will place this industry upon a strictly scientific basis. This investigation has continued for years at great expense, and for years was fruitless. At least the only result for many years was to prove that the sources of error were so great and numerous, and the fallacies so many and so intricate as to leave the question in hopeless confusion.

For the benefit of our readers we give the results first, and then state the manner in which they were obtained, so that critics may decide how far test conditions have been secured. The data are the results of many trials, and the tabular statement does not represent either extreme, nor even the average of such trials, but has been based on a wheel which appears to be a practical average of wheel.

To show how wide are the extremes we would state that the fastest cutting wheel removed 18 lbs. $2\frac{1}{2}$ oz. of

cast iron in 30 minutes, and the slowest cutter only 2 lbs. $5\frac{1}{2}$ oz. The fastest wearing wheel lost 47 ozs. in 30 minutes, and the slowest wearing less than $\frac{1}{2}$ oz. Our tabular statement gives the cost per pound of removing or wearing away different metals by different methods, as based on half hour tests. It is not claimed that any man can grind, file or chip for ten consecutive hours at the half hour rate. In fact, we know it to be impossible. Before inaugurating the half hour tests a succession of one minute tests was made, and it was demonstrated that the one minute rate could not be kept up for 30 minutes, and that it decreased more rapidly with the file and cold chisel than with the wheel. Were the half hour extended to a day of ten hours, the so far uncalculated decrease in rate of wearing off metal would increase the cost to some unknown figure beyond that in the table; but, as after statements will show, the change would result in a still better showing for the wheel.

We now ask attention to the two following tables, re-iterating and emphasizing the fact that the results represent neither the extremes nor the average of the trials made, but are based on the work of what appeared to be an average wheel.

TABLE A.

Half-hour tests on Brass, Cast Iron, Wrought Iron and hardened steel, with Solid Emery Wheel, File, and Hammer and Cold Chisel.

Weight of metal removed by	Brass. lbs. oz.	Cast iron. lbs. oz.	Wrought iron. lbs. oz.	Saw steel. lbs. oz.
Emery wheel.....	17	7 12	2 8	3 7
File.....	0 8	0 5 $\frac{1}{2}$	0 2 $\frac{1}{2}$	0 1
Hammer and cold chisel.....	1 4 $\frac{1}{2}$	2 5 $\frac{1}{2}$	0 10 $\frac{1}{2}$	0 1 $\frac{1}{2}$

In obtaining the results tabulated above the same emery wheel was used on all the metals by the same man.

TABLE B.

Cost per pound of removing or wearing away metals, as based upon Table A.

	Brass. Cents.	Cast iron. Cents.	Wrought iron. Cents.	Saw steel. Cents.
Emery wheel.....	1.8	5.8	21.2	28.9
File.....	25.8	36.9	75	206.4
Hammer and cold chisel.....	10.1	5.5	19.6	137.6

The cost table given above was arrived at as explained here.

A uniform rate of \$2.50 per day of 10 hours was fixed for grinder, filer and chipper, and 3 cents per oz. was fixed as the net cost of an emery wheel. A solid wheel 14 in. dia. and 2 in. thick (the size adopted in all the trials) weighs about 30 lbs., and is priced in some lists at \$19.70. A discount of $33\frac{1}{3}$ per cent. makes the net cost \$13.13 net,* or $2\frac{1}{2}$ cents per pound.

It is a simple matter to get at wheel cost exactly, as its measure is the actual consumption of the wheel. The file cost is a much more difficult matter, and we can only approximate it, trusting to time and the work of other investigators to give this cost. We have assumed a 14-in. bastard file to cost, net, 16 cents, and have estimated its life as two days. In other words, we give the same \$2.50 per day for labor and 8 cents per day as the cost of file.

We have absolutely no data by which to calculate the wear and tear of cold chisel and hammer, but have roughly estimated it the same as that of file.

The conditions of experiment were as follows: Fourteen-inch flat bastard files were used on cast iron, wrought iron and brass, and 14-in. flat mill saw file on saw steel. New files were used, time accurately taken and skillful mechanics employed. The pieces of cast and wrought iron filed were $\frac{1}{2}$ in. thick, and the brass $\frac{1}{4}$ in. thick. These pieces were clamped in vise and a length of about 6 in. filed over, the filer paying no attention to shape in which metal was to be left, but simply filing in such manner as to remove as much metal as possible.

The emery wheel used was 18 $\frac{3}{4}$ in. dia. at beginning of first test by $1\frac{1}{2}$ in. face, and was reduced to 13 $\frac{3}{4}$ in. at end of last test. It weighed 19 lbs. 18 oz. at the conclusion of the last test. The highest number of revolutions, as shown by a Taylor speed indicator while the wheel was actually at work, was 1,660 per minute, and the lowest 1,580. This wheel was mounted on a machine weighing 662 lbs., which stood upon a concrete floor resting on 3 ft. depth of stone, and was fastened by bolts extending through concrete and stone bed to beams underneath the bed. This machine was run by a 4 in. belt.

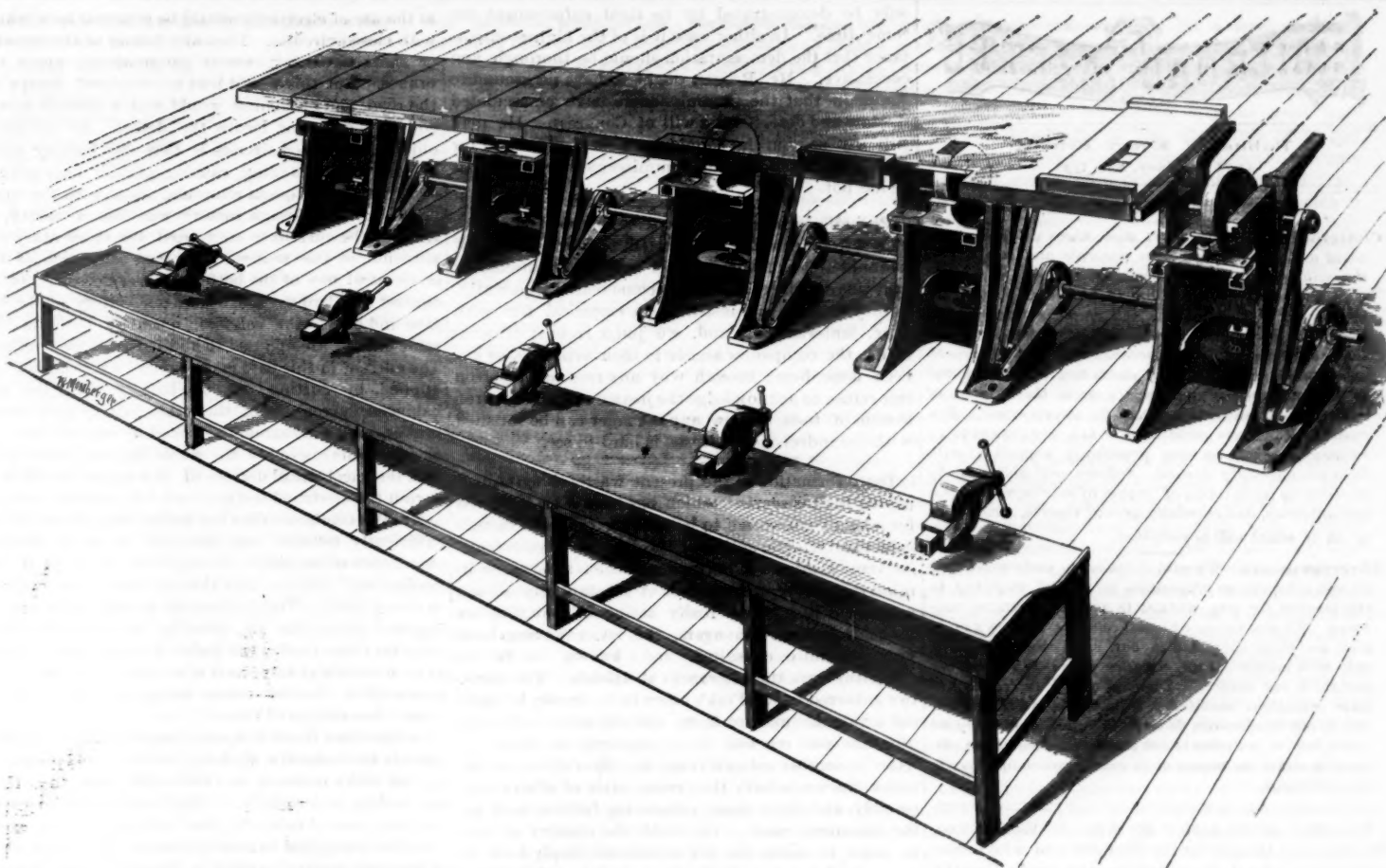
The cast-iron bars ground were 2 in. wide, $\frac{1}{2}$ in. thick and 3 ft. long at the beginning, and about 8 in. long at the end of the test. The wrought-iron bars were the same length, $1\frac{1}{2}$ in. wide by $\frac{3}{8}$ in. thick. The brass was a block 4 in. wide and $\frac{3}{4}$ in. thick, but was fastened to the end of a bar so that the leverage and ease of handling were the same as in the case of the cast and wrought iron. The saw steel was strong, $\frac{1}{2}$ in. thick, and as the half of a 24 in. circular saw was used, about 12 in. leverage was obtained.

The maximum cost of grinding off 1 lb. of cast iron, as shown by all the trials, was 11 $\frac{1}{2}$ cents. This is counting the wheel at $33\frac{1}{3}$ per cent. discount from list price, as in previous table. The minimum cost of grinding off 1 lb. of cast iron was 2.4 cents. This minimum is arrived at by using the results of the most economical wheel used, and counting its cost at 60 per cent. discount from list; a discount not uncommonly offered on professedly first class wheels.

A further study reveals the following facts: The same wheel which ground off 5 oz. of cast iron in 1 minute ground off 120 oz. in 30 minutes, or at the rate of 4 $\frac{1}{2}$ oz. per minute, a deduction of only 16 per cent. in the minute rate. The file which removed $\frac{3}{8}$ oz. of cast-iron in one minute only removed $5\frac{1}{2}$ oz. in 30 minutes; a deduction of 40 per cent. in the minute rate.

It is entirely uncertain how far this greatly decreased

* A statement given further on gives the cost per pound of removing cast iron with the most economical wheel tried and at extreme discounts.



FITTING SHOP SPECIALLY ARRANGED FOR EMERY WHEELS.

ratio in the file product is due to loss of strength in the filer, and how far to increasing dullness of file. The fact remains that in one-half hour's work, the wheel product rate per minute decreased only 16 per cent. as compared with 49 per cent. for that of the file. This difference is probably due to both the causes mentioned, but it is impossible to state in what proportions. Were the trial extended to 10 hours, the results would vary in a greatly increasing ratio in favor of the wheel; for, leaving out of consideration the relative amount of fatigue in the two processes, the file would grow duller and duller, while the wheel would be as sharp at the end of the tenth hour as at the beginning of the first. The strain and fatigue would probably be greater to the filer than to the grinder, and the loss due to fatigue would also continue in an increased ratio as the filing proceeds.

The product of the file cannot be increased by increasing the size of the file, the standard sizes adopted for files being manifest proof that such sizes have been found a practical maximum. The wheel product, however, can be greatly increased. The wheel whose product is given in Table A was only 1½ in. face, and its product of 7 lbs. 12 oz. of cast iron removed in 30 minutes bore direct relation to the length of the line of contact between metal and wheel. This size of wheel was adopted as an average size, suited for ordinary hand use in ordinary shops. The quality was also selected as an average. Wheels of much greater size are, however, in common use, 36 in. dia. by 4 in. thick, being a size used in Europe, while wheels 8 in. thick are occasionally used.

The product of a wheel where the line of contact was 8 instead of 1½ in. may be computed by theory, but there are no data from actual trial. It is evident that 124 oz. (7 lbs. 12 oz.) is at the rate of 70.8 oz. for a one-inch line of contact. As $70.8 \times 8 = 566.4$, or 35 lbs. 4 oz., this amount might be removed with a larger wheel. Wheels with large bearing surface on line of contact are used in architectural iron works and in marine work, and there is no practical reason why this theoretical result should not be attained in practice, where large beams and braces are held against the wheel.

Our next consideration, as suggested by table A, is the probable effect on the productive power of wheel and file of the various metals used.

Table C now given shows the actual amount of wheel consumption in the tests covered by table A.

TABLE C.

Half-hour tests on brass, cast iron, wrought iron and hardened saw steel, with solid emery wheel.

	Brass.	Cast iron.	Wrought iron.	Saw steel.
Oz.	Oz.	Oz.	Oz.	Oz.
Weight of emery wheel removed by one half hour's grinding	6½	11	13½	29

The ratio of wear, as shown in this table (C) is probably not governed entirely by the hardness of metal, but there is little doubt that the order of wear holds good. Now, the order in the amount of metal removed by wheel and file is so nearly the same, that this fact, in connection with the order of increased wear of wheel, entitles us to infer that the order and ratio of wear of file approximates to that of the wheel. Table D sets forth this order. It indicates certain anomalous facts regarding wrought iron and steel, which call

for much more experiment, and it is highly probable that such study would, in time, lead to the much more accurate adaptation of special classes of wheel to the different metals, and possibly lead to special tempering of files.

TABLE D.

Half-hour tests on brass, cast iron, wrought iron and hardened saw steel, with solid emery wheel and file.

	Brass.	Cast iron.	Wrought iron.	Saw steel.
Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.
Weight of metal removed in one-half hour's grinding	17 0	7 12	2 8	3 7
Weight of metal removed in one-half hour by file	8	5½	2½	1
Weight of emery wheel removed in one-half hour's grinding	6½	11	13½	1 13
Percentage of wheel removal to metal removal	2.4	8.0	33.8	52.7

We are forced to draw our conclusions as to the wear of file from these analogies, as, at present, we have no exact data showing the wear on files of the various metals. If, however, the file product decreased from 8 oz. per half hour of the soft metal brass to 1 oz. per half hour of the hard metal steel, while the wheel wear increased from 6½ oz. to 29 oz., we feel warranted in assuming that the file wear also greatly increased.

But the important fact now claims attention that increased wear of the emery wheel does not diminish its production, while wear of the file does. The increased wear of the emery wheel gives an increased cost per pound of metal removed, but does not diminish its half-hourly product. The wear of the file steadily diminishes its productive capacity. At the end of the tenth hour the wheel can still remove its 3 lbs. 7 oz. of saw steel in half an hour (except so far as fatigue of grinder may lessen the product), but if the wear of the file increases in anything like the same ratio as the wear of the wheel, the last half hour of the day would be far from seeing the removal of the 1 oz. per half hour which is shown in the table.

It is impossible in this article to do more than suggest the various points of economy. The article is mainly intended to show the difference in cut of file and emery wheel. It has been pointed out, often and forcibly, before, that where a great number of small pieces are to be worked the time consumed in clamping and unclamping them in the vise is so great a loss that probably the whole work of grinding could be accomplished in that time. As a matter of shop practice there are few if any instance where emery wheels are introduced for general work with any such liberality as to give them a full chance. In factories where it has been found that some special work could be done to advantage; as in plow jointing, planer knife grinding, etc., etc., machines enough and of the best have been introduced. But the rule in shops seems to be to supply vises and files freely, and introduce grinding machines so sparingly that they are not accessible enough to be of general benefit.

Few shops have ever been planned for the use of grinding machines, such machines being bought separately, and added one by one as some special need demanded them. In the accompanying sketch the general order of things is reversed, and a shop is shown which has been specially planned for grinding processes.

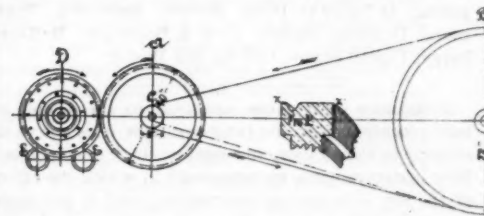
The vise bench is placed in the middle of the room, and at its side is shown a continuous emery table. This is so arranged that the tops of the wheels (which have a simple vertical adjustment), can be used in the same plane with the top of the table, or slightly above it, as in the well-known surfacing machine said to have been originally suggested by Sir Joseph Whitworth. When in such use the wheel is entirely cased in, so that nothing can fly out if the wheel bursts. If it is desired to use the wheel at centre of its face, in the ordinary way, the front half of table top is thrown over, it being hinged for that purpose.

The present practice is to use file and vise for all general work, and only go to the emery wheel with such pieces as those whose exceptional shape, hardness, etc., call for some other process. If a radically different idea prevailed and the employer taught his men to use the file only for such work as they could not easily do on the wheel, a new and immense economy would be initiated.

Certainly it is a marvelous and scarcely suspected fact that the cost of filing off cast iron is as 37 cents per pound is to 2.4 cents per pound for grinding.

Wheel Dressing Machine.

On April 30 there was shown at Arlington, Vt., an experimental device for truing up car wheels, designed by Mr. Miltimore. A soft steel disk A, whose edge is made to conform to the wheel tread and flange, as shown at X X', fig. 2,



is held up against the wheel D, which rests and slowly revolves on friction rollers e e, while the disk is driven at high speed. In the trial the disk was run 2,160 revolutions per minute, giving a speed of 4.3 miles per minute to its periphery. One steel-tired wheel, which had been three years in service, one new steel-tired wheel and one new chilled wheel were finished up smooth and round, averaging 13 minutes each. The cost is estimated at less than 50 cents per wheel.

Petroleum Fuel.

According to the Russian *Technic*, the administration of the Tambov-Saratov Railroad has made experiments as to the relative cost of wood, coal and Baku petroleum, with the following result: One cord of wood is equal in value to 3,420 English pounds avoirdupois (95 poods) of coal and 2,736 pounds (76 poods) of petroleum, while the cost of these quantities is \$15.73 (1 silver rouble = 75 cents) for the wood, \$15.68 for the coal, and \$13.46 for the petroleum. Results still more favorable for petroleum have been made on the Orenburg, the Warsaw-Terespol, and on the Dunaburg-Vitebsk railroads. Besides these lines the Trans-Caspian, the Trans-Caucasian, the Grjasi-Zarizyn, the Mornhansk-Sysran, and the Rjlsan-Korlow railways use petroleum for fuel.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Too much credit cannot be given to the Chicago, Burlington & Quincy for the liberality and wise public spirit shown by it in organizing and conducting the brake tests now closing at Burlington. The company has done the public a service of a very high kind, and at no small cost. It has furnished track, crews, supplies, shops and workmen, and the loss from the disarrangement of business must be considerable. The company's officers have given time, skill and extraordinary energy to make the tests as successful and as nearly conclusive as, in the nature of things they could be. They have been ably aided by the assistants from other roads, and the tests have been carried out with quite remarkable precision and smoothness. There have been no mishaps, good feeling has prevailed, and if any of the competitors go home beaten, they will surely feel that they have had fair play.

The preliminary examination of couplers which have been invited to compete for the prize of adoption by the 30,000 to 40,000 miles of road represented in the combination will be made in New York on June 6. This examination will be mainly confined to capacities for automatic coupling, for meeting without coupling and for uncoupling at varying heights and on curves. It will be entirely private. Tests for strength, and probably practical endurance tests extending over a considerable period, will follow. At this writing the owners of 12 couplers—7 hook, 4 link and pin and 1 link and hook—have signified their intention of competing, as follows: Hien, Barnes, Browning, Thurmond, Dowling, Janney, Titus & Bossinger, McKeen, Perry, United States, Gifford and Marks.

It becomes daily more apparent to the people of many localities that the Inter-state law does not work entirely in their favor, and against the "monopolies." New instances come up constantly in which the effect of the law is to destroy competition, and to put more money into the pockets of certain carriers at the expense of other carriers and of shippers. We hear little from those who are gaining by the operation of the law, but it is quite apparent that there are many besides railroad companies who are losing by it. As self interest, more or less enlightened and more or less modified by conscience, is at the bottom of this as of other laws, its repeal or amendment will be likely to come pretty soon if the sufferers predominate as largely as the petitioners and complaints indicate. Meantime it is becoming obvious to everybody that the Commissioners cannot possibly reconcile and satisfy the conflicting interests that appear, and that they are not at all likely to try to permanently nullify the operation of the law. On all accounts it is to be hoped that they will not. If the law is to do more good than harm that can only be after a somewhat costly process of readjustment, and a process that will take a good deal of time. If it is to do more harm than good that can

only be demonstrated by its rigid enforcement for some time. In either case it is of the highest importance that the demonstration should be thorough and conclusive. Mr. Reagan ought to have no ground to complain that the Commissioners have emasculated the law and defeated the will of Congress. He may still say so, but he should have no good ground for saying so. No doubt the Commissioners will see that he has not.

Prejudice against scientific tests for color-blindness makes trouble in England as well as in this country, it would appear from a recent newspaper discussion over there. The enginemen become scared apparently, as they do here, and insist on an empirical test with flags, lanterns, etc., and, we judge from statements made, the companies accede to their demands, as has been done here; though why any reasonable person can refuse to acknowledge the justice of the Holmgren system of tests, or how any manager can be satisfied with the indecisive flag tests, is hard to see.

The reformation of the present wasteful system of paying for car-service, which has been a crying need for a long time, seems to be making progress, though it be slowly. The action of the late car accountants' convention takes on importance when it is borne in mind that the representatives of substantially all the prominent lines were really acting as mouthpieces for their general managers, the latter having been very generally consulted and known to be in sympathy with the utterances at Atlanta. The statistics gathered in Mr. Fink's office have already brought out a valuable mass of facts, and the action taken by him has now reached a very encouraging stage. A letter in another column from an officer of one of the trunk lines sets forth the present state of affairs very forcibly, and gives some interesting facts to back up the statements made. To double the number of cars in order to make the car movement simply *hold its own*, which is substantially the experience of the lines whose experience is cited, is, indeed, going into "rolling storehouses" with a vengeance; though whether cars which stand still 20 hours a day can reasonably be called rolling stock may be a question. The mythical general manager who instructed his station agents to occasionally set their cars moving to prevent flat wheels, was perhaps not wholly without justification after all.

Our correspondent touches upon a vital point, where he refers to the complete reversal of motive which under the proposed system would actuate the men in charge of car movement. To act on his own road with authority instead of at arms' length with no authority, as in sending appeals to foreign roads, makes all the difference in the world in an officer's efficiency. The one is strength, the other worse than weakness. Lost car agents have to spend a large share of their time in apparently fruitless work: to be able to set them at work at home, where tangible results would be at least probable, would be a good beginning toward reform at any rate.

THE BURLINGTON BRAKE TESTS.

The Burlington brake trials are now virtually ended. They have shown considerable improvement in the means of controlling the speed of long freight trains, but perhaps the most remarkable feature has been the general adoption of electricity, which has been proved capable of operating the valves of air brakes so as to secure greater quickness of action, less shock and better graduation of the power applied.

The action of electricity may be uncertain, but in the trials it has given no trouble when properly fitted, under the supervision of an electrician. The failures of the Park brake were chiefly due to the defects in the mechanical apparatus. The defect in electric application arose simply from careless insulation. The trouble with the electrical apparatus in the Eames brakes is accounted for by the fact that it was fitted by an engineer, and not by an electrician. There appears to have been no defect in the electrical appliance of Westinghouse and Carpenter, and it is significant that the only brake not using electricity, the Hanscom, will be brought forward, as the inventor states, at any future trials, with electric attachments.

It is objected that electricity may fail without warning and destroy the power of stopping quickly. But the air brake will still remain in full force, and perhaps be quite as available as if there were no electrical attachment. Of course the distance in which the stop could be made would be longer than with electricity in use, and the stop would be attended with more shock. If the hose bursts or the train breaks in two, the brakes are still applied automatically by the air, as shown in the break-away tests of the Westinghouse, Eames and Carpenter. One of the objections

to the use of electricity would be removed by working with closed circuits. Then any failure of the current, or short circuiting, would automatically apply the brakes. But this would lead to additional delays on the road, and brakemen would find it difficult to discover the cause or locate the defect. An electrical objection to closed circuits is that the battery must be constantly running, causing greater expenditure and requiring frequent renewals; while with the open circuit a small storage battery will last a month, at least, as the current is only used for momentary application of the brakes. This last objection of uneconomical use of the battery power does not obtain against the Card system, where one battery on the engine and one in the caboose, normally both on the same circuit, are opposed to and balance one another. The current in this case is used only when brakes are applied, by cutting out one battery, when the unbalanced current from the other battery applies the brakes, and graduation is effected by cutting out one or more cells instead of the whole battery. It is a pity that the mechanical defects of this apparatus did not permit the electrical features to be thoroughly tested.

Mr. Westinghouse does not believe that electricity is sufficiently reliable, and proposes to use it only for emergency stops, and does not profess to adopt it for graduating. He uses only three or four electric valves in a long train. These valves are placed in the couplings and let out the air, virtually dividing a fifty car train into four twelve car trains, the air being let out at each electrical valve as it is now done at the engineer's valve. So few valves being used there is, of course, less chance of failure.

On the other hand, Carpenter manipulates his brake entirely by electricity, applying, releasing and graduating the brake pressure, and the trials show that this can be done successfully. The triple valve in each car being moved instantly, the full pressure in each cylinder is attained in a shorter time than with any of the other apparatus tried, as shown by the brake-beam pressure diagram in another column.

It is claimed that experience with train signaling shows electricity to be an unreliable agent for use on trains. But when we consider the great variety of purposes for which it is now used, the constant increase of its application and the very rapid growth in electrical art in all directions, it does not seem very sanguine to prophesy that it may be successfully used in train braking.

A very noteworthy feature of these tests is the entire absence of buffer brakes, which will now probably sink into oblivion. The absence of the three buffer brakes, the withdrawal of the Card electrical and the Hanscom air brake and the decision of the American not to exhibit, have left only three competitors—Carpenter, Eames and Westinghouse.

We defer any analysis of the relative merits and demerits of these brakes until the special trials now in progress at Burlington are completed. In them some special features of practical importance will be tested, and changes and improvements that the general tests have shown desirable will probably give some interesting results.

THE CANADIAN PACIFIC.

The report of the Canadian Pacific for 1886 was submitted to the shareholders' meeting May 11, and an abstract is given in another column. The present position of the road as a competitor not only for trans-continental traffic, but for the traffic of the Northwest and the Lake region, and its prospects for further eastern and western connections, make this report especially interesting. The company operated at the end of the year 4,652 miles, of which 821 were leased lines. The net earnings were \$3,703,487, being 36.74 per cent. of the gross earnings, which were \$10,081,804. The fixed charges were \$3,068,042, leaving surplus net earnings of \$635,445. Although a very considerable amount of the gross earnings was for material of construction transported, this part of the business was charged the actual cost of transportation and does not affect the net earnings.

The assets were \$226,405,231, including \$35,000,000 as the cost of lines built by the government, and nearly 15,000,000 acres of land at \$2 per acre. Neither of these two items appear in the condensed balance sheet; but including them, the nominal surplus of assets over all liabilities is \$109,305,716. The government loans have been paid from the proceeds of the first-mortgage bonds, and by the surrender to the government of 6,793,014 acres of land; and it is estimated that on July 1 next, when the St. Lawrence bridge and the extension of the Ontario & Quebec Railway to Montreal on the east, and to London on the west, are turned over to the company, and the new terminals of the company at Montreal and

Toronto are provided for, the fixed capital liability of the company will be:

First-mortgage bonds, \$7,101,500.....	\$34,898,633
Canada Central bonds.....	1,823,333
Province of Quebec.....	7,000,000
North Shore Railway bonds.....	436,053
Leased lines capitalised at 5 per cent.....	25,236,000
Total fixed capital liability.....	\$69,484,019
Add ordinary share capital.....	65,000,000
	\$134,484,019

Making annual fixed charges of \$3,492,600. Cash is deposited with the government to pay a 3 per cent dividend on the capital stock until August, 1893.

The opening of the St. Lawrence bridge and the construction of the "Short Line" to a connection with the Southeastern will very shortly give the Canadian Pacific a line to Boston, and permanent trackage rights have been secured over the Maine Central, which will put them in connection with the system of New Brunswick and Nova Scotia. A subsidy has been granted for the construction of this "short line" and for a line from Fredericton to Moncton. Thus a line is obtained from Montreal to Halifax 100 miles shorter than the Intercolonial route, and it is expected that within a year the trains of the company will run from Halifax to Vancouver. The most important auxiliary lines now in progress west of Montreal are the Algoma Branch to Sault Ste. Marie, and the extension of the Ontario & Quebec from Woodstock toward the Detroit River. It is hoped that arrangements may be made with other lines such that the extension of the Ontario & Quebec beyond London will not be necessary, but either by a new line or by traffic arrangements with existing lines, a Detroit and Chicago connection will doubtless be secured. The Sault Ste. Marie line, by agreement with the Duluth, South Shore & Atlantic and the Minneapolis, Sault Ste. Marie & Atlantic, gives the Canadian Pacific direct lines to Duluth and Minneapolis.

The Canadian Pacific is to be a formidable competitor then with existing lines for the transcontinental traffic, for traffic with certain lake ports, and especially for the trade with the great wheat centres of the Northwest.

Even without the influence on rates of the Interstate Commerce law, this line would naturally take a respectable share of the transcontinental traffic. From deep water at Montreal to the Pacific is 2,900 miles and from New York to San Francisco is 3,300 miles. The company has established a temporary line of steamers to Yokohama and Hong Kong, and negotiations are in progress with the Imperial government for the establishment of a permanent line on that route; while a first-class line of mail and passenger steamers across the Atlantic is under consideration by the Dominion government. Besides these influences, for much of the year the comfortable temperature and the fresh scenery would attract a greater or less proportion of the passenger travel to this new route. How much of the earnings of 1886 was from transcontinental business there is nothing in the report to indicate; except perhaps the negative suggestion of this passage: "Your line succeeded in securing a considerable share of the through traffic, mostly at remunerative rates." Although the first through train went over the line in November of 1885, it was not till June, 1886, that it was opened for through traffic, and no adequate estimate of that business could yet be made even if the figures for the last year were given. But the value to the Pacific roads of the transcontinental business may easily be over-estimated, and it is not in that business that the real force of the Canadian Pacific as a competitor will be most seriously felt by the "American" lines. In his last report President Adams says, "But that business [the transcontinental] has recently been so divided by completion of competing lines, of which there are now six, that it furnishes but 7.5 per cent. of the road's revenue." The transcontinental rate war which reduced the freight rate from 1.06 cents per ton per mile in 1885, to 0.58 cent in 1886, and caused the Union Pacific to carry fifty-nine million tons more in 1886 than in 1885, for \$463,000 less money, was abnormal, and let us hope will not recur; but the fact remains that the Pacific Coast business, when divided amongst the six competitors, can yield but little net revenue to any one of them.

It is in the longitude of Manitoba that the real trouble begins. The Canadian Pacific is in position to practically control the business north of the border, and traffic arrangements with the St. Paul, Minneapolis & Manitoba have heretofore given them a good deal from the South.

The efforts of the Provincial Government of Manitoba to charter lines in the province which might compete with the Canadian Pacific, have repeatedly been annulled by the Dominion Government. Whether or not that will be the fate of the charter now proposed, permitting the Northern Pacific to build a branch

into Manitoba, is not certain. Sir George Stephen has protested against the charter, and threatens to build a line from Selkirk to Portage La Prairie, cutting Winnipeg out of the Canadian Pacific line, if it is granted, and in any event his road to-day is in control north of the boundary line, and even if American branches are let into Manitoba, it will still be likely to carry most of the wheat not destined to the Minnesota mills. What will be its relations in the future with the St. Paul, Minneapolis & Manitoba cannot be said, but the completion of the lines now building from Duluth and Minneapolis toward the Sault will make the alliance with that road of less importance to the Canadian Pacific. Indeed, the Sault Ste. Marie lines, with the Canadian Pacific to Montreal, Portland and Boston, will open a new and very important route between the Atlantic and a great region now tributary to the old trunk lines.

From Duluth to Montreal is, say 1,000 miles, and from Minneapolis to Montreal is less than 1,100 miles by the proposed routes, or less than 200 miles further than from Chicago to New York. To Portland and Boston the distance is about 300 miles further. So that the new route will give the country northwest of Chicago a shorter communication with deep water in the summer than it now has, and in the winter the route from Duluth or Minneapolis to Boston or Portland will be but 1,300 or 1,400 miles. From Minneapolis, by the Pennsylvania lines, to New York is 1,230 miles, to Philadelphia 1,140 miles, and to Baltimore, by the Baltimore & Ohio, is 1,270. From Duluth to Minneapolis is 150 miles.

As far as distances only are concerned then, the Canadian Pacific route may well take an important part of the Northwestern traffic. Whether or not it can get sufficient return freight to make the traffic profitable is quite another question, and one which involves changes in the centres of distribution, both on the seaboard and in the Northwest, too great and too speculative to be profitably studied now.

The transportation of cattle to the seaboard may become an important part of the business of the Canadian Pacific. Cattle from the northern ranges of the United States have already been driven further north to graze in Canada, and finally be shipped to market over the Canadian road.

But the Canadian Pacific as a competitor for the traffic carried now by the trunk lines is one thing. As a dividend paying line it is quite another. It should be remembered that it is a far northern line through a thinly settled country. It has already spent \$1,400,000 for snow sheds. For some 1,000 miles it passes through a forest country which must fill up very slowly. West of that there is a vast fertile territory which will be settled more rapidly, but yet not nearly as rapidly as has been our western and northwestern territory. This new country is remote from the centres of distribution, and there is not established in Canada that great westward movement which in the states has been growing for a century. Beyond the wheat growing and grazing area there is no known mining region of large extent and wealth, and on the western coast the Canadian Pacific does not find large cities, the centres of established commerce, and a state already rich in developed agriculture and mines. In short, the conditions are very different from those under which our own far Western lines have been built, and their profits have not been extravagant. The shareholders of the Canadian Pacific have 3 per cent. dividends secured to them till 1893 by cash deposited with the Government. So far they are secure, and they can wait the events of the next six years with tolerable composure. For the railroads the case is different. They have learned too well that the road which is not earning dividends is apt to be the most troublesome competitor.

THE TIME CONVENTION.

The discussion on the train rules at the April meeting appears to have been less varied, and so perhaps less interesting, than that at the first consideration of the rules last October; but this does not necessarily imply a lack of interest or of features that could be improved by further airing. As it was, several gentlemen brought out good points; others doubtless agreed with the speaker who said that it was an extremely bold proceeding to try to pick a flaw in the committee's work, and kept silent accordingly. A good deal of time was spent on the rule concerning full-faced figures to indicate meeting points on time-tables, but to no great profit, apparently. The time and labor given by the committee and the convention to this subject may almost be said to have been wasted in a vain attempt to apply the methods of forty years ago to the complex business of to-day; for the use of full-faced figures undoubtedly originated when the

printing of more than one time for a train at a way station was a rare exception; and it is by no means certain that the plan could not now be wholly abolished without detriment. The present practice of many roads and the dictates of common sense tend strongly to emphasize as the most important and sensible point among the present utterances on this subject, the committee's recommendation that "attention be called to the trains that are to be met or passed, by number."

The rule about tail lights was considerably discussed, but was finally left as originally reported. The use of a white light with the red ones, as practiced by some Southern roads, and advocated in the convention, doubtless has its advantages, but whether they are great enough to warrant the departure from principle involved in showing a safety and a danger signal side by side seems not to have been settled by the discussion, though the vote showed that, at least a majority thought they were not.

The discussion brought out plainly the desirability of employing the principle of telling men what they must not do, even where they have already been told elsewhere what they must do under the same circumstances. The committee tried, and, indeed, any one undertaking the task they did would likewise try, to avoid saying the same thing twice to the same person; except for some such limitation as this, there would be no bounds in any direction; but rule 519 and others like it exemplify the utility of reinforcing a statement in varied form so that instructions will not "have to be gathered up from the general context." The discussion on rule 500 showed that fine distinctions in language are better appreciated than they used to be; those who have regarded matters of form as so far subordinate to the essentials as to be beneath their notice, will do well to carefully follow the utterances of the gentlemen who did the talking at the convention.

The discussion of the relative merits of the double and the single order systems was not so full as could be desired. Many influential officers still believe the single order system to be necessary in certain contingencies, and if the committee's stand in favor of the double order system is to be upheld, it ought to have a chance to be fully explained and defended, so that all removable objections shall be set aside, and the side that prevails not only receive a majority vote, but an overwhelming one. Although the telegraph rules are now up for trial, it seems likely that those who have the single order system in use will retain it for another six months at least. At the October meeting it is to be hoped that a full and free exhibit of all the arguments may be brought out. With first-class dispatchers a poor system may show good results; but it must be borne in mind that not only should the universal code of the country provide for the occasional poor dispatcher (which some roads are still afflicted with) but that the best dispatchers are entitled to all the advantages of the most perfect system. And the original *iam*-uniformity—should not be allowed to drop out of sight as it seems to have done in some cases.

The adoption of the train rules proper is likely not to be very widely accomplished before autumn, for the reason that so important a change, involving the alteration of numerous local and other rules outside of the convention's code, requires time and careful consideration, and a single month proved too short a time for it. The unsettled condition of the telegraph code is therefore less to be regretted.

An important though often unnoticed point in the practical application of uniformity is the numbering of the rules. Different roads should not only have their codes as nearly alike as their consciences will allow, but the likeness should be manifest, even to the most careless observer. To this end all alterations should be made by adding sentences where practicable, either in separate rules, or if in the same rule, in different type, perhaps. Additions should be numbered 123 ff (following the standard code) except where there is a plain advantage in putting them among the other rules. If a rule of the uniform code is to be omitted, its number should be left blank. Only in this way can the advantage of uniformity be fully secured.

Discipline of Enginemen.

In another column will be found some interesting circulars showing the principles which govern the division of responsibilities and the discipline of the men in the motive power department of the Philadelphia & Reading. While these may not be materially different from those followed on numerous other roads, an enlivened interest in the matter is shown by the mere fact of their being formulated and circulated

among the subordinates. One of the chief defects in the relations between companies and their employes has been, not that wrong principles were followed, or serious injustice done, but that so little pains has been taken to inspire all the grades with the same motives that direct the action at headquarters. Simple comity requires that men, no matter how low their grade, who are ever likely to be required for higher duties, be informed of the details of those higher duties to the fullest possible extent, whether the giving of this information be deemed of immediate practical advantage to the employer or not. This advantage, even if not measurable in figures, can hardly fail to more than pay for the very slight effort and expense needed to change from the secret to the open way of acting.

While we are by no means disposed to criticise Mr. Cushing, and, in fact, must regard him as in advance of the majority of managing officers in the system he has formulated, we take the liberty of noting a few points in which still further progress is desirable. It is not forgotten that financial figures in the directors' room decide many of these questions. Quite likely we are telling no news to Mr. Cushing, who doubtless finds, with hundreds of others, no difficulty in devising improved methods of management much faster than the power to put them in force is forthcoming. The opening paragraph of the circular seems to indicate that the line of promotion and its exact course through the various stages of freight and passenger firing, shop work, etc., are still somewhat hard to settle upon and define, but such a settled outline certainly would be of value even if it had to be frequently deviated from. To have classes subdivided to such an extent that they contain very few individuals, and then to seek for a man in a certain class and find that what few suitable ones there are in it are debarred from accepting promotion because domestic reasons or the smallness of the increase of pay make it more profitable for them to stay where they are, is discouraging, and tempts the appointing officer to stick to the old way, of picking out the best man he knows of regardless of the bearing his action will have upon the aspirations of other men; and yet there can be little question that added definiteness would, in the long run, simplify the management of this department.

The mention of a good record for regular habits suggests a query as to how this record is to be obtained and kept; and the next sentence suggests moral considerations which ought to make it plain to aspirants that there is no danger of their attaining too high a standard. The requirement concerning teetotalism marks progress from the ancient times when only the hours of duty were taken into account by employers.

The willingness to help learners "so far as time will allow," while often felt, is not so commonly expressed. It is, of course, eminently reasonable, and should be a reminder to general managers and their superiors that the duty of providing the time and the favorable circumstances lies upon them; and the mention of men's "desire to know" some things suggests action by the management toward directing these desires into the most profitable channels.

The promotion to passenger runs of those who are oldest in service, other things being equal, is a just principle, of course; but the question suggests itself whether there ought not to be a limit of age, beyond which men should not be employed in certain grades. Other things often are not equal. Men often have to be "jumped" because they are believed to be too old, and many runners are to-day remaining in their responsible and trying positions when they would retire to some easier berth if they could do so honorably and without unreasonable pecuniary loss. A man over 62 years old might with considerable reason be declared too old for a locomotive runner as well as for an officer in the army. Even in the case of vigorous and ambitious men who are perfectly willing to continue running five, ten or more years beyond this limit it is not at all certain that the road ought not to make early retirement practicable and attractive, simply in the interests of true economy and elevation of the service. The proper requirements of this branch of the service are exceedingly exacting on the mind, and, to an elderly person, considerably so on the body. No doubt many men retain passenger runs only through the open or secret relaxing of some of these requirements.

Examination of candidates has become common in this department with the best roads, and is coming more and more to be a really, as well as a nominally, useful thing. Some of the best roads have for this duty a board consisting of five or six officers, such as train-dispatcher, train-master, division master mechanic, etc., which doubtless provides a better examination than can be had by the division superintendent alone. Mr. Cushing's remark about

the superintendent's interpretation of rules suggests again the difficulty and the necessity of making rules that can be given but one interpretation. This, and the hint that rejection is likely to be the lot not only of those who cannot understand rules at all, but of those who absorb knowledge slowly as well, show that the true aim and scope of an examination are well appreciated.

The road foreman of engines has become on many roads an important officer, and will naturally become more so. His varied duties we shall have to discuss at another time. An officer who must "at all times be in readiness to take responsibilities that may be desired of him," cannot be dismissed in a single sentence.

April Accidents.

Our record of train accidents in April, given in this number, includes 28 collisions, 58 derailments and 4 other accidents; a total of 90 accidents, in which 41 persons were killed and 108 injured.

These accidents are classified as follows:

COLLISIONS:	
Rear.....	11
Butting.....	17
DERAILMENTS:	
Spreading of rails.....	7
Broken bridge.....	5
Defective switch.....	1
Broken wheel.....	4
Broken axle.....	2
Misplaced switch.....	4
Runaway train.....	3
Landslide.....	6
Miscellaneous.....	6
Unexplained.....	20
OTHER ACCIDENTS:	
Broken connecting rod.....	1
Miscellaneous.....	3
Total.....	90

The causes of collisions where given were as follows:

Trains breaking in two.....	4
Mistake in giving or understanding orders.....	5
Miscellaneous.....	2
Unexplained.....	17
Total.....	28

A general classification shows:					
	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road.....	5	13	2	15	14
Defects of equipment.....	5	8	2	15	17
Negligence in operating.....	6	7	1	14	16
Unforeseen obstructions.....	8	8	9	25	28
Maliciously caused.....	2	2	2	6	7
Miscellaneous.....	3	3	1	7	8
Unexplained.....	17	20	37	74	82
Total.....	28	58	4	90	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Passenger.....	3	20	3	26	29
Freight and other.....	49	37	1	87	97
Total.....	52	57	4	113	100

The casualties may be divided as follows:

	Collisions.	Derailments.	Other.	Total.	P. c.
KILLED:					
Employes.....	16	20	2	38	88
Passengers.....	2	2	2	6	7
Trespassers.....	1	2	3	6	7
Total.....	17	24	7	48	100

Twenty-four accidents caused the death of one or more persons each, and 21 caused injury, but not death, leaving 45—one-half of the whole—against which no such charge is made.

The comparison with April, 1886, shows:

	1887.	1886.
Rear collisions.....	11	10
Butting ".....	17	3
Crossing ".....	3	2
Derailments.....	58	39
Other accidents.....	5	5
Employes killed.....	38	36
Others.....	6	13
Employes injured.....	74	43
Others.....	34	62
Pass. trains involved.....	26	22

Average per day:

Accidents.....	3.00	3.20
Killed.....	1.37	0.77
Injured.....	3.00	3.50

Average per accident:

Killed.....	0.455	0.348
Injured.....	1.200	1.591

The figures for the month show a general and marked falling off from those of the previous month, as is usual at this time of the year, though the number of employes killed—38 in April, 32 in March—appears, as has been seen to be the case in previous comparisons, to be appalling in its regularity. The number of employes injured was also fully as high as in March; and of passengers also if we deduct the hundred or more hurt at Forest Hills March 14.

The comparison with April of last year is noticeable chiefly in the record of butting collisions and of persons killed. Of the employes killed this year 10 were laborers on gravel trains, etc., five accidents having occurred to that class of trains, so that the actual degree of hazard in the trainman's vocation is somewhat exaggerated by the figures. The Bardwell's Ferry disaster, on the Troy & Greenfield road, occurred in April of last year; deducting the 11 killed and 36 injured there from the totals for that month, makes the comparison much less creditable to this year's record.

A rather unusual case was the derailment of a train by two men lying upon the track. The men were killed, but we cannot consistently charge their death to the "train accident" (when the facts warrant the placing of the whole

charge on the opposite side of the books), and they are therefore omitted, as are the five fatalities from the falling of a tank, which was indeed consequent upon a train accident and possibly remotely caused by it.

One of the peculiarly pathetic cases last month was the derailment of a New York Central passenger train by a wash-out near St. Johnsville, N. Y., April 18, at a point where, of the road state, especial care had been taken, though in vain, to inspect the roadbed sufficiently often to secure safety. The engineman, Edward Kennar, evinced the heroic nature which goes unnoticed (because unheard of) in the breasts of hundreds of his brethren daily, by forgetting himself and telling those who made ineffectual attempts to rescue him from the wreck alive to give their first attention to the protection of the train by a red signal.

The Employers' Liability law, so called, which has been under consideration in the Massachusetts legislature for several years, has finally been passed, to go into effect Sept. 1 next. As is generally known, the law is similar to that which has been in force in England since 1880, though the latter has nothing corresponding to sections 2, 4 and 6 of the Massachusetts law. The status of employes of sub-contractors is doubtless, however, well defined in England by other statutes. Trainmen will do well to bear in mind that this new law does not help them much, if any, in case of "coupler accidents;" nor indeed could it reasonably do so. It is unfortunately true that almost invariably such casualties involve contributory negligence. Most companies tell their men, explicitly or otherwise, that time must be taken to do coupling safely, and they thus largely relieve themselves, notwithstanding the fact that temptations to take risks are sure to be great and to be yielded to. The fact remains that one of the greatest incentives to action on the safety coupler problem is that of humanity and must remain so. The railroad that is wholly soulless can continue to maim its brakemen for a good while yet. The English employers' liability act expires by limitation at the end of this year unless sooner renewed.

The proposition to put a duty on foreign grain, animals and meat in Belgium is meeting with great opposition. The Minister of Finance made a strong speech in the Chambers denouncing the movement. On the other hand, in Italy, the Minister of Finance announced, April 20, that the most striking fact connected with the prevailing agricultural depression in that country is the decline in farm rents. It is estimated by good authorities that the decline in the value of farm products during the past few years amounts to about \$10 per acre, and landlords have been compelled to reduce their rents in proportion. In Fifehire, one of the leading agricultural counties, an estate of 968 acres which up to two years ago rented for £717, is now let at a rental of £325. Another, which six years ago brought £1,240, is now let at £640. Throughout both Scotland and England reductions of 30 and 40 per cent. are quite frequent. In 1875 one of the great London hospitals enjoyed an income of £41,500 from farm lands in its possession; the income from the same lands at present is about one-half of that sum.

The American Brake Co.'s electric air brake train did not appear at Burlington after all—a severe disappointment to Mr. Poor, the designer, as well as to the company. The company's shops being overcrowded with work, it became necessary to order the cylinders made elsewhere. They were put together hurriedly, mostly by night work, and at the last moment were discovered to be imperfect and leaking badly. The company hope within a few months to perfect the brake and make a series of tests at St. Louis, which may be compared with those made at Burlington. They propose also to give their 50-car train—which they own—a long run service test, similar to the one to Ogden and back, as suggested in these columns last week. The present disappointment is not theirs alone, as it was on all accounts desirable to have all the air brakes tested at the same time and place, but their consolation is that it was due to their shops being over full of orders for steam driver brakes, which are meeting with extraordinary success—the May orders alone being for 142 locomotives.

The May report of the Department of Agriculture shows the average condition of winter wheat to be 85.8, a falling from the April report of a little more than two points. In 1883 it was 83.5 at the same time, and in 1885, a very bad crop year, it was 70. In every other year since 1882 it has been higher than now. Little change in acreage is reported. The rainfall has been less than the average, except in New England, the lower lake region and the North Pacific Coast region, and in some sections the deficiency of rain has done much injury to the crops.

The area of cotton planted is slightly greater than any of the preceding five years at this date, but the dry season has necessitated considerable replanting.

From tables recently published in Edinburgh it appears that the season of 1886 has been disastrous to the Scotch and English ranching companies operating in the United States. The herds of 9 companies decreased from nearly 500,000 head of cattle in 1885 to less than 440,000 head in 1886, and the decline in prices per head sold was 11 per cent. The fall in prices of shares was over 50 per cent.

The condition of pasturage on the ranges seems, on the whole, to be very good now, although the effects of drought are severely felt over large areas of the Texas ranges.

The Treasury Department at Washington has issued instructions to the effect that the United States Customs off-

cars stationed at different points in Canada are authorized to examine the baggage of passengers destined for places in the United States and place the same in sealed or locked cases or compartments. The Grand Trunk road has announced that it will accordingly afford facilities to passengers with through tickets enabling them to have their baggage examined by United States officers at either Montreal, Brockville, Prescott, Toronto, Stratford, or London, as may be most convenient. The examination at the frontier being dispensed with, much inconvenience will be obviated, especially in the case of trains that cross the line at unreasonable hours.

It has been announced before that the Baltimore & Ohio passenger stock is to be equipped with the Westinghouse brake. The latest form of quick-acting triple valve, first used at the Burlington trials, will be applied, for the first time in regular service.

The Chicago, Burlington & Quincy is adopting on its new consolidation engines a 60-inch boiler and Belpaire fire-box, above frames. The Belpaire fire-box was illustrated and described in the *Railroad Gazette* July 9, 1880, and has been shown in illustrations of several locomotives since. This company finds flanges on the first and third pair of drivers better than on the second and fourth.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows:

St. Paul, Minneapolis & Manitoba, from Minot, Dak., 95 miles, 35 miles since last reported.

This is a total of 35 miles for the week, making 1,302 miles reported thus far for the current year. The new track reported to the corresponding date for 18 years has been:

Miles.	Miles.	Miles.	Miles.	Miles.
1887.....1,302	1883.....1,503	1879.....619	1875.....260	
1886.....553	1882.....3,203	1878.....507	1874.....436	
1885.....546	1881.....1,480	1877.....461	1873.....918	
1884.....913	1880.....1,519	1876.....542	1872.....1,557	

This statement covers main track only, second or other additional tracks and sidings not being counted.

NEW PUBLICATIONS.

Light on the Law: A Reference Book on the Act to Regulate Commerce. 215 pp.; no index. The Railway Age Publishing Co., Chicago. \$1.50.

This little book contains the text of the law as enacted, the original Reagan and Cullom bills, a pretty full report of the debates in the Senate and House last December and January, and various documents from Mr. Fink, General Alexander, Mr. Blanchard and others. Some of the rulings made by the Commissioners, in April, are also added. The collection is convenient for any one who has occasion to study the Interstate law.

Journal of the Association of Engineering Societies. The May issue of this journal contains papers on Architectural Engineering, The Great Water-Way to Connect Lake Michigan with the Illinois River and Traction Rope Railways. The annual address of Mr. Wright, the retiring president of the Western Society, is also included, as well as the usual index to current professional literature.

Train Accidents in April.

The following accidents are included in our record for the month of April:

COLLISIONS.

REAR.

2d, very early, freight on Baltimore & Ohio ran into another freight near Attica, O., damaging several cars.

4th, freight on Louisville & Nashville ran into some cars broken loose from a preceding section near Adams, Tenn., and the engine and 10 cars went down a high bank and were badly wrecked, injuring the fireman.

5th, p. m., on Union Pacific in Junction City, Kan., engine ran into a passenger car and injured a passenger.

5th, night, freight on Pittsburgh, Cincinnati & St. Louis ran into preceding freight which had come to a sudden stop near Collier's Station, Pa., damaging several cars and injuring the engineer and fireman.

6th, p. m., freight on Louisville, New Albany & Chicago ran into preceding freight near Bedford, Ind., badly wrecking the caboose. Conductor and a passenger seriously and 2 other passengers slightly injured.

6th, on Cincinnati, Indianapolis, St. Louis & Chicago, near Colfax, Ind., a rear collision of freights wrecked the caboose and injured a brakeman seriously and 2 other trainmen slightly.

10th, early, coal train on New York, Lake Erie & Western broke in two near Otisville, N. Y., and rear section ran into forward one, wrecking several cars.

15th, on Pittsburgh, Fort Wayne & Chicago, near Lucas, O., a freight train broke in two and rear section ran into forward one, wrecking several cars.

21st, early, on Central Vermont, near Milton, Vt., 27 freight cars standing on a siding started without apparent cause down a heavy grade and overtook and collided with a preceding freight train. Thirty cars were thrown off the track down an embankment into an adjoining field and badly wrecked.

23d, early, on Philadelphia & Reading in Fairhill, Pa., a freight train broke in two and rear section ran into forward one, damaging several cars and killing a brakeman.

24th, a. m., on Delaware & Hudson Canal Co.'s road, near Windsor, N. Y., engine of freight train which had cut loose to run ahead and take on cars ran into a preceding coal train and was followed and run into by its own train, damaging the engine and 8 cars.

BUTTING.

1st, night, on Memphis & Charleston, near Middleton, Miss., butting collision between two freights, killing an engineer and fireman. The wreck caught fire and was consumed.

2d, very early, butting collision between two freights on Michigan Central near Springfield, Ont., completely wrecked both engines and 26 cars, and killed 2 brakemen. Operator failed to put out signal.

4th, very early, butting collision between two freights on Pennsylvania Railroad at Bolivar, Pa., wrecked both engines and several cars. Two cars of cotton caught fire and were consumed.

4th, on Missouri Pacific, near Independence, Mo., a butting collision between two freights wrecked both engines and 3 cars.

6th, night, butting collision between two freights on Missouri Pacific, near Vassar, Kan., wrecked both engines and several cars and injured a trainman.

8th, on Texas & St. Louis, near Liberty, Tex., butting collision between two freights badly wrecked both engines and 25 cars. A tramp who was stealing a ride was killed. Cause, misunderstanding of orders.

12th, p. m., butting collision between freight and construction trains on Cincinnati & Muskingum Valley, near Lancaster, O., damaged both engines and several cars. A laborer fatally and a conductor and 5 laborers more or less severely injured.

15th, early, butting collision between through and switching freights on Baltimore & Ohio, in Baltimore, damaged both engines and several cars.

17th, early, on Chicago & Northwestern, at Palatine, Ill., butting collision between two freights badly wrecked both engines and 6 cars, and damaged a large water-tank, which soon after fell and killed 5 spectators. It is stated that one of the engines became unmanageable and could not be controlled.

18th, early, on Chicago, Burlington & Northern, near Diamond Bluff, Wis., butting collision between a freight and work-train wrecked both engines and several cars; fireman fatally and 3 other trainmen severely injured. Cause, misunderstanding in orders.

21st, p. m., on Northern Pacific, near Chelum, Wash. Ter., butting collision between work-train and light engine completely wrecked both engines and a flat car, killed 5 laborers, and injured 18 others. Cause, mistake in orders.

22d, night, on Milwaukee, Lake Shore & Western near Russell, Mich., butting collision between two freights badly wrecked both engines and 5 cars.

23d, a. m., on Denver & Rio Grande, near Manitou, Col., butting collision between a passenger and a freight. The freight was pushing a car of timber, which broke the force of the shock somewhat. The passenger conductor injured.

23d, p. m., on New York, Lake Erie & Western, in Paterson, N. J., butting collision between a switching train of empty passenger cars and a passenger train, damaged engine and several cars.

24th, p. m., on Southern Pacific, near San José, Cal., butting collision between a special passenger and a freight standing on the main track, wrecked both engines, injured one passenger badly and several others slightly.

30th, p. m., on Philadelphia & Reading, near Tamaqua, Pa., butting collision between two freights, completely wrecked both engines and several cars, killing a brakeman and severely injuring engineer and fireman. Cause, dispatcher's mistake.

DERAILMENTS.

SPREADING OF RAILS.

6th, night, passenger train on Dayton & Ironton was derailed near Jamestown, O., by spreading of the rails.

7th, p. m., freight on Missouri Pacific derailed near White-wright, Tex., by spreading of the rails, wrecking 12 cars.

8th, p. m., passenger train on Northern Pacific was derailed near Bismark, Dak., by the spreading of the rails, damaging dining car and two coaches, injuring a passenger and a trainman fatally and 8 passengers severely.

11th, freight on Los Angeles & San Gabriel Valley was derailed near Garvanza, Cal., by the spreading of the rails.

12th, on Terre Haute & Indianapolis, near Marshall, Ill., several cars of a freight were derailed by spreading of rails.

14th, on Atchison, Topeka & Santa Fe, near San Miguel, N. M., an engine and 12 cars of freight were thrown from the track by the spreading of the rails and went over an embankment, making a bad wreck, killing 1 brakeman and seriously injuring 3 other trainmen.

17th, early, 5 cars of freight on Dayton & Ironton were thrown from the track near Xenia, O., by spreading of the rails.

BROKEN BRIDGE.

5th, p. m., several cars of passenger train on Pensacola & Atlantic went through a trestle near Chaffin, Fla.

18th, early, on Southern Pacific, near San Fernando, Cal., a freight broke through a trestle, and 14 cars went down into the creek and were wrecked.

22d, a. m., on Grand Trunk, near Morrisburg, Ont., freight went through the bridge over Nash's Creek, killing the engineer and fireman and injuring a brakeman. Thirteen cars went down in a bad wreck.

23d, p. m., on Atlantic & Pacific, near Winslow, Ariz., a freight train fell through a partly burned bridge, wrecking 15 cars and killing the fireman and 2 tramps.

23d, early, on Louisville, Evansville & St. Louis near Hoffman, Ind., a freight train went through a culvert which had been weakened by freshet, wrecking 10 cars and injuring 3 tramps.

DEFECTIVE SWITCH.

7th, p. m., passenger train on California Southern was derailed by a defective switch in Colton, Cal.

BROKEN WHEEL.

12th, on Ashtabula & Pittsburgh, near Niles, O., 14 cars of freight were derailed by a broken wheel.

19th, night, on Atlantic & Pacific, near Ashfork, Ariz., a broken truck wheel under engine of passenger train derailed engine and several cars, seriously injuring 3 trainmen.

22d, early, on Atlantic & Pacific, near Chalender, Ariz., engine and baggage car of passenger train were derailed and overturned by a broken wheel under the engine.

27th, very early, on Pennsylvania Railroad, near Princeton, N. J., engine of freight was derailed by a broken wheel, considerably damaging the running gear.

BROKEN AXLE.

7th, a. m., passenger train on Boston & Albany was derailed near Rochdale, Mass., by broken journal.

12th, p. m., 2 cars of passenger train on Intercolonial road were derailed and turned over near Hopewell, N. B., by broken axle under the tender, injuring 3 passengers.

MISPLACED SWITCH.

7th, very early, switching freight on Louisville & Nashville ran over a misplaced switch and was derailed in Nashville, Tenn., damaging several cars and adjoining building.

7th, p. m., freight on New York Central & Hudson River ran over a misplaced switch and into some cars on a siding at Geneva, N. Y.

13th, night, passenger train on Pittsburgh, Ft. Wayne & Chicago ran over a misplaced switch and into a switching engine in Allegheny City, Pa., damaged both engines, severely injuring engineer and fireman.

30th, on New York, Lake Erie & Western, at Port Jervis, N. Y., a freight engine was derailed by a misplaced switch.

RUNAWAY TRAIN.

22d, early, on Union Pacific near Beaver Canon, Idaho, 16 cars of freight became uncoupled and ran back 3 miles down a heavy grade at very high speed, when the cars left

the track and went over a precipice, making a bad wreck, killing the conductor and injuring a brakeman.

28th, early, on New York, Lake Erie & Western near Big Shanty, Pa., 50 loaded coal cars ran away and jumped the track while going at very high speed and were completely wrecked; 1 brakeman fatally and another severely injured.

27th, p. m., on Boston & Albany, at East Brookfield, Mass., 11 cars of a freight train, which had been left standing on the main track on a grade with brakes off and had come down grade at a high rate of speed, were turned upon a side track in order to avoid possible collision with a passenger train and ran off the end of the side track down a bank, piling up 6 of the cars in a bad wreck.

LANDSLIDE.

5th, p. m., passenger train on Northern & Northwestern was derailed near Munising, Ont., by sand which had been washed over the rails in a deep cut, slightly injuring 2 trainmen.

16th, p. m., freight on Fitchburg road ran into a landslide in a cut near Orange, Mass., wrecking engine and 7 cars. Engineer and fireman jumped and were slightly injured.

18th, early, on Central Vermont, near Middlesex, Vt., engine of passenger train ran into a landslide and was thrown from the track down a high embankment and badly wrecked.

18th, night, passenger train on New York Central & Hudson River ran into a landslide near St. Johnsville, N. Y., and the engine went over an embankment into the Mohawk River, killing engineer and injuring fireman.

20th, a. m., on Fall Brook Coal Co.'s road, near Blackwell's, Pa., engine and 2 cars of freight train were derailed and considerably damaged by a boulder which had rolled down upon the track.

21st, early, on Pittsburgh & Western, near Fuller, Pa., a coke train ran into a large boulder and was badly wrecked. The fireman and a brakeman were crushed to death, and the engineer was thrown from the cab into the Toughiogheny River and seriously injured.

MISCELLANEOUS.

5th, night, passenger train on Mobile & Ohio ran over a purposely misplaced switch and was derailed at Carroll, Tenn.

6th, on Minneapolis & St. Louis, near Waseca, Minn., a passenger train ran over some cattle and derailed the express and baggage cars and 2 coaches, injuring 2 trainmen.

10th, a. m., freight on Boston & Albany derailed near Russell, Mass., by a brake-beam which had dropped on the track. Five cars went down a high bank.

12th, very early, freight on Chicago, Milwaukee & St. Paul was derailed near Roselle, Ill., by a tie which had been placed across the track, wrecking engine and 4 cars and injuring a brakeman.

17th, night, several cars of freight on New York Central & Hudson River were derailed in East Rochester, N. Y., by the falling of a brakebeam.

27th, night, on Terre Haute & St. Louis, near Vandalia, Ill., an engine and 6 cars of freight were derailed by running over two tramps, who were lying across the track, and who were both instantly killed.

UNEXPLAINED.

1st, p. m., on Knoxville & Augusta near Maryville, Tenn., 2 cars of freight train were derailed, seriously injuring a brakeman.

1st, p. m., 6 cars of freight on St. Louis, Arkansas & Texas were derailed near Brinkley, Ark., and wrecked.

2d, p. m., freight on Boston & Albany was derailed in Cambridge, Mass., killing a trainman and injuring another.

4th, p. m., passenger train on International and Great Northern was derailed near Hearne, Tex. Two cars upset, injuring several passengers.

6th, night, engine of passenger train on Austin & Northwestern was derailed and upset near Austin, Tex. Fireman killed and engineer seriously hurt.

8th, night, car in switching freight on Fitchburg road jumped the track at Prison Point, Mass., and knocked down the switchtender's house, injuring 1 employé fatally and 3 others more or less severely.

8th, on Michigan & Ohio, near Moscow, Mich., a car in passenger train was derailed and tipped over, injuring the conductor and 1 passenger seriously and 3 other passengers slightly.

9th, a. m., freight on St. Louis Bridge & Tunnel road was derailed in East St. Louis, Ill. The engine was overturned and 5 cars piled on top of it, slightly injuring engineer.

9th, on Chicago, Milwaukee & St. Paul, near Lima, Ia., 11 cars of freight were derailed and wrecked.

10th, p. m., 2 cars of freight on New York, Lake Erie & Western derailed near Scio, N. Y.

13th, night, construction train on Ohio River road derailed near Ravenswood, W. Va., and engine and 10 cars were piled together in a bad wreck. A brakeman and a laborer killed, engineer fatally, and fireman badly injured, and conductor and 4 laborers more or less severely injured.

14th, night, passenger train on New Jersey & New York derailed near Park Ridge, N. J., and the tender and 1 car rolled down an embankment.

16th, p. m., freight on Pennsylvania Railroad was derailed at Kittanning Point, Pa., and 3 cars wrecked.

19th, p. m., on Florida Railway & Navigation Co.'s road, near Sumterville, Fla., passenger train derailed, doing some damage.

20th, on Louisville, Evansville & St. Louis, near Taswell, Ind., a freight overtook a work-train and started to push it up a grade. After going a short distance, one of the cars of the work-train loaded with sleepers jumped the track and several cars were piled up in a bad wreck. Three laborers were killed and 2 injured.

22d, early, on Indianapolis & Vincennes, near Indianapolis, Ind., a freight train was derailed, overturning a box-car and the caboose.

27th, noon, on Baltimore & Ohio, near Timberville, Va., a freight train derailed, wrecking three cars, killing a brakeman and injuring the conductor.

30th, early, on Fitchburg road, in Watertown, Mass., a car in freight jumped the track and ran along over the sleepers for some distance, when it struck and partially overturned a car standing on a siding, and was thrown over an embankment and badly damaged.

30th, noon, on Northern Pacific, near Driscoll, Dak., 5 cars of passenger were thrown from the track and upset in the ditch. One passenger was killed and 7 others more or less severely injured.

OTHER ACCIDENTS.

9th, p. m., engine of passenger train on Boston & Albany broke a piston-rod when near State Line, Mass.

12th, p. m., engine of passenger train on New York, Lake Erie & Western broke a connecting-rod when near Jersey City, N. J., and the loose end badly demolished the cab.

19th, p. m., on New Jersey Central, at Pamapo, N. J., a loose door of car in passing freight swung out and scraped several cars of passenger train, smashing a number of windows. Two passengers injured by broken glass.

26th, p. m., on Arkansas Midland, near Helena, Ark., a

loaded car in freight train caught fire from sparks from the engine and was destroyed.

A summary will be found on another page.

Master Mechanics and Enginemen on the Philadelphia & Reading.

Mr. G. W. Cushing, Superintendent of Motive Power of the Philadelphia & Reading, has issued the following circular concerning promotions to the position of locomotive engineer:

PROMOTIONS.

I. Promotion to road engineer necessitates regular service as fireman on the P. & R. R., and it may become expedient to choose from the ranks of firemen men for switch engines and work trains. Where the circumstances are favorable, firemen may first be used as hostlers, until thoroughly familiar with that important line of duty, and advance through the grade of shifting and pusher engineers, to regular road service, if found in all respects capable and worthy. Those firemen will be selected who possess a good record for regular habits, who stand well as men, and who are sufficiently educated in their duty to become creditable to the service. None who are known to use liquors in any quantity as a beverage will be selected. With this in view it will be well for the firemen to seek information relative to their duty, and to fit themselves for advancement. To those who are so disposed, the officials of the railroad connected with the Machinery Department will cheerfully give such information as time and circumstances will permit.

The Road Foreman will instruct engineers and firemen in all matters they desire to know.

LINE OF PROMOTION.

Those who are advanced to the grade of road engineer will retain that rank. In case at any time it becomes necessary to decrease the number of road engineers, those who are dispensed with will be offered temporary places in a lower grade, the youngest to switch engines and firemen, but their places in proper rank will be held open for them.

PASSENGER TRAIN MEN.

Selections for passenger train engineers will hereafter be made from the ranks of freight engineers, the oldest in service, if worthy and capable in all respects, will have the preference. Men who are offered passenger runs and decline to accept them, will thereby waive their right to the run offered, and it will remain discretionary thereafter if they shall again be offered the passenger run.

EXAMINATION OF MEN.

All men employed as road engineers shall be required to pass examination before the division superintendents or their representatives, relative to their understanding of the transportation time tables or book of rules, and the interpretation given by the Superintendent must be accepted and acted upon by the engineer.

In cases of dullness in comprehending rules, the Superintendent will decline to certify to the fitness of the applicant, in which case he will not be employed as locomotive engineer.

The same officer has also issued the following definition of the duties of master mechanics of divisions, road foremen of engines and the general road foremen; the connection these have each with the other and with the officials of the transportation department:

The master mechanic at points where such official has charge, and on divisions where placed, or the general foreman at other points, represents the superintendent of motive power and rolling equipment in all matters of local interest pertaining to the repairs of machinery. He has charge of shops and men employed in and about them, and is the responsible head to whom and through whom orders should be issued and communications addressed on local business of the machinery department.

Orders for engines; the employment or suspension of men; the changing and placing of engines on his division, and of men in charge of them; the increase or reduction in forces or of wages paid; work necessary to be done on engines or in shops, will be ordered through the Division Master Mechanic or the General Foreman in charge at local points.

These officials in matters affecting the joint interest of the Transportation and Machinery Departments will consult with and aim to meet promptly the requirements of the division superintendents, reporting to the Superintendent all matters of which he should be advised.

The Road Foreman of engines on divisions will assist the Division Superintendent in matters that affect the running of trains, and the discipline of men in handling trains; report cases of disregard of road rules, and at all times be in readiness to take responsibilities that may be desired of him.

He will report to the Master Mechanic or local foreman the condition of engines, repairs necessary, conduct and ability of engine men.

The use of fuel, oils and stores, and proper handling of engines, are matters he will constantly note and report upon.

The trials of new engines, and of new men on engines, will generally be in charge of the Road Foreman of engines.

His reports on the failure in capacity of men from any cause, or of objections to them by the Machinery or Transportation Department, should be made promptly to the Division Master Mechanic, who under advice of the Superintendent of Motive Power and Rolling Equipment will take action necessary. The Division Road Foreman will be advised with in cases of promotion of men.

The General Foreman of Engines will have charge of the distribution of engines under advice of the Superintendent of Motive Power and Rolling Equipment, and in the changing of men on divisions, taking prompt action also when necessary in the line of duty prescribed for the division road foremen. He will consult freely with the superintendents, report to the Superintendent of Motive Power and Rolling Equipment in all matters of interest or as hereafter is instructed.

In cases of accidents involving the engineers or firemen, he will endeavor to meet division officials without delay, and when necessary or required, assist them in the investigation of cases.

The tests of use of stores and materials on engines will generally be in charge of the General Road Foreman of Engines.

TECHNICAL.

Bridge Notes.

W. G. Coolidge & Co. have recently been awarded the contract for all the Howe truss bridges (19 spans) upon the line of the Minneapolis, Sault Ste. Marie & Atlantic; also for the Howe truss bridges on the Merrill and Albany extensions of Chicago, Milwaukee & St. Paul.

Hoffman & Bates have the contract for the bridge over the Columbia River at Pasco, Wash. Ter.

The Anniston & Cincinnati has let the contract to build three iron bridges between Anniston and Gadsden, Ala., and

a large iron bridge across the Coosa River at Gadsden, to the Atlanta Bridge & Axle Co., of Atlanta, Ga.

The Naugatuck road has given the contract for an iron bridge at Torrington, Conn., to the Berlin Iron Bridge Co. of East Berlin, Conn. It will be in one span of 140 ft.

The Ohio Connecting Railway Bridge Co. has the plans perfected for connecting the Pittsburgh, Cincinnati & St. Louis and the Pittsburgh, Fort Wayne & Chicago over the Ohio River. The bridge is to be of iron and steel, for two tracks, with piers of sandstone.

The new iron bridge erected at Vanceboro, N. B., over the St. Croix River, the joint property of the New Brunswick and the Maine Central roads, was built by the Passaic Rolling Mills, of Paterson, N. J. It is 154 ft. centre to centre of end piers.

Wm. H. Brown, Chief Engineer of the Pennsylvania road, asks proposals for building a double track, three span, ribbed arch stone bridge over the Little Juniata River. Mr. Brown's address is 233 South Fourth street, Philadelphia.

Manufacturing and Business.

Messrs. R. P. McCormick & Co., Kansas City, Mo., contractors for the double track railroad tunnel at Kansas City, 1,000 ft. long, have placed their order with the Ingersoll Rock Drill Co., of New York City, for a complete plant of tunneling machinery, consisting of 1 Straight Line air compressor, 1 air receiver, 7 Ingersoll tunneling drills, with columns, mountings, etc., boilers, etc. Messrs. McCormick & Co.'s contract requires the completion of the tunnel within 90 days.

The Stewart Heater Co., Buffalo, N. Y., will shortly commence the erection of new works at Kensington Station, on the New York, Lake Erie & Western road, about four miles from the present location. The new building, which will double the present capacity, is to be 40 by 80 ft., two stories high.

The firm of Walkley & Co. has established an office at 10 Wall street, New York, for the sale of second-hand railroad equipment, consisting of passenger and combination coaches, freight cars, locomotives, etc.

In Montana complete Rand air compressing and drilling plants have been sold to the following mines: The Jay Gould Mining Co., compressor and drills; Yellowstone Land & Exploring Co., compressors and 3 drills; Kootenay M. & R. Co., compressor and 6 drills; Teston M. & S. Co., compressor and 3 drills; Judith Basin M. Co., compressor and 4 drills; Alice G. & S. M. Co., complete drill outfit; Lexington M. Co., complete drill outfit; Granite Mt. M. Co., 3 drills; Drum Lammon mine, 6 No. 13 Improved Sluggers; Anaconda mine, 2 drill outfits; Elkhorn M. Co., complete drill outfit. In Utah, Christy M. Co., complete drill outfit (Little Giants); Lead mine, compressor and drills; Daly and Ontario mines, 4 drill outfits complete; the Eclipse mine, compressor and 4 drills; Eureka Hill M. Co., 6 No. 13 Sluggers; drill outfits complete. In Oregon, Seven Devils M. Co., compressors and 4 drills. In Manitoba and British North America, Rand's 16 by 30 Duplex, Class A, compressor and 10 drills. In Mexico, Zacatecas M. Co., Duplex compressor and 15 drills; Botello M. Co., a 400 horse power compound Corliss compressor and 30 drills.

The Farrell Foundry & Machine Co., of Ansonia, Conn., manufacturers of the "Blake style" of rock breakers, have taken out a new patent, consisting of an adjustable toggle block by which the length of the stroke can be adjusted to suit any size of stone or any particular product, while the machine is in motion.

The Jackson & Sharp Co. are building at Wilmington ten new passenger cars for the Norfolk & Western road, equipped with the Frost dry carburetter system of lighting. Separate carburetters over each lamp are used, on the same plan as on the Pennsylvania railroad cars.

Iron and Steel.

The Pittsburgh Steel Casting Co. shut down their works on the 7th inst., for the purpose of making repairs. The stoppage will last for about two months and throws 200 men out of employment.

The Sloss Steel & Iron Co., at Birmingham, Ala., has let the contract to build its two furnaces to Gordon, Strobel & Laureat of Philadelphia, Pa. They will cost about \$450,000. The capacity of each will be 125 tons. The contract for 150 bee-hive and 69 Thomas coke ovens has been let, and 150 more ovens will soon be contracted for.

The three new blast furnaces on Breaker Island, Troy, N. Y., are ready for operation. The work of constructing the furnaces began Jan. 14, 1886. Each furnace has a capacity of 150 tons daily. As soon as the fires are lighted the contractors will turn over the furnaces to the Troy Steel & Iron Co.

The North Park Mining & Smelting Co., of Peoria, Ill., has been incorporated. Capital stock, \$360,000.

The Alexandria Coal Co. will build 200 ovens at Crabtree, Westmoreland County, Pa.

The Northwestern & Duluth Smelting & Refining Works are to be located in Duluth, Minn. The capital to be employed is over \$2,500,000. The company receives 137 acres of land free, situated at Grassy Point, upon which work has already commenced. C. R. Fletcher, of Boston, is the chief engineer. C. B. Batchelder, of San Francisco, Prof. Moses G. Farmer, government electrical engineer, and E. D. Peters, Jr., constructing engineer of the Calumet & Hecla Copper Works, are the other interested parties.

The steel melters at the Black Diamond Steel Works, Pittsburgh, have had their wages advanced \$1 per ton. The advance was voluntary and unsolicited.

Thomas F. Rowland, of Brooklyn, N. Y., has merged his business, generally known as the Continental Works, into an incorporated concern, under the title of Continental Iron Works, which will continue the manufacture of gas-holders and heavy special machinery as heretofore. The officers of the new company are Thomas F. Rowland, President; Warren E. Hill and Charles H. Corbett, Vice-Presidents; and Thomas F. Rowland, Jr., Secretary and Treasurer. The works in Brooklyn cover about four acres of land.

The Rail Market.

Steel Rails.—A few sales are reported, aggregating between 7,000 and 10,000, with a number of inquiries still in the market, one lot of 5,000 tons for the South and one of 4,000 tons for Mobile delivery. Quotations, \$38.50 for standard sections at eastern mills for delivery up to October.

Old Rails.—Only one or two small transactions are reported. Double heads and Tees, \$21.50.

Scrap.—Market continues dull, with foreign offered at \$20.00 to \$20.50 and yard scrap at \$22.00 to \$22.50, with choice lots available at \$23.

Rail Fastenings.—At a meeting of the Spike Association, held in New York, the card rate of 2.75c was reaffirmed. Quotations: Spikes, 2.50c; angle fish bars, 2.15 to 2.25c; steel angle bars, \$2.25 to \$2.30; bolts and nuts, 3.10 to 3.20c; and bolts and hexagon nuts 3.25 to 3.30c.

The Strong Locomotive.

The Wilkesbarre Record says: The test that has been in progress for some time on the Lehigh Valley ended May 20, with a run up the mountain on train 5, leaving Wilkesbarre at 1 P. M., with locomotive 444 and eight cars, one of which was the dynamometer car of the Pennsylvania road. By the latter the pull of the locomotive, the time on every part

of the road and a complete record is taken. This train left Wilkesbarre nine minutes late and went to Glen Summit eight minutes late, making the run from Sugar Notch to Fairview, 12 miles of 96 feet grade, in 24½ minutes, with one slow-up on account of cattle on the track. This is the heaviest train by two cars, or 25 per cent. in weight, that has ever been pulled up this grade at this speed. The engine was fired with soft coal and was almost smokeless, and had full pressure of 155, at which point she was blowing off, part of the time while being worked the hardest, nearly at the top of the mountain. This is considered by experts to have been the best run ever made by a locomotive at heavy express work, and it is doubted whether there is another locomotive now running that is capable of doing so well. This engine ran from White Haven to Glen Summit on Thursday with nine cars, the 10½ miles of 68 feet grade, in 19½ minutes.

A New Tank Steamer.

It is stated that the Standard Oil Co. are about to contract for the construction of an iron tank steamship for the coastwise trade, to carry 260,000 gallons in bulk. She will be 192½ ft. long, 30½ ft. beam, and 16 ft. depth of hold, with triple expansion engines, steel boilers, with forced draft and all the latest improvements in marine engineering.

The Emery Testing Machines.

The Yale & Towne Manufacturing Co. and Messrs. William Sellers & Co. issue a joint circular stating that arrangements have been made by which the latter company has an exclusive license in the United States for building the testing machines on the Emery patents and that the Yale & Towne Co. transfer to them all the drawings, patterns, special tools, etc., pertaining to that part of their business. The Yale & Towne Co. have built in the last five years some ten machines of capacities ranging from 60,000 lbs. up to 300,000 lbs., but as the plant and organization required for the very delicate and peculiar work involved in this class of machines does not harmonize with any of the various classes of work which they manufacture, they have transferred the business to Messrs. Sellers & Co., whose establishment is better adapted to the character of the work demanded by the testing machines. The Yale & Towne Co. retain for sale several finished testing machines of 75 and 150 tons capacity, which are completed and subject to inspection at the works, and can be delivered at once.

Rotary Snow Plow.

The following is from the report of W. T. Small, now Superintendent of Motive Power, Northern Pacific Railroad, on the Leslie snow plow:

"The plow is built in a substantial manner and capable of doing hard service; there are but few parts liable to get out of order. The knife-wheel and fan are secured to one shaft and not on separate shafts as is generally supposed, and the snow is discharged by the centrifugal force of the wheel."

"We left Shoshone with a train consisting of snow plow, two ten-wheel engines, one wrecking outfit car and 1 O. R. & N. special car for Ketchum, a town located at the foot of the mountains and terminus of the branch."

"On our way we passed through several cuts, ranging from 100 to 2,000 ft. long, filled with snow to a depth of 3 ft. The plow passed through without any check to the speed. One side cut was found filled with snow, about 16 ft. on one side, and 4 ft. on the other, and the plow was run through at a speed of about 4 miles per hour, throwing the snow fully 100 ft. from the track. At Ketchum one engine was sent with the plow to clear a side track of 4 ft. of snow on the level, and at the place opposite the freight depot, where the snow and ice has been shoveled from the platforms, the snow was about 7 ft. deep. The plow was pushed through without delay, and threw snow and ice over telegraph wires. This plow does about all that is claimed for it in the way of throwing snow, and in my opinion is a success. There is a track flange arranged under the body of the car, and operated by a steam cylinder, which does very good work. After the plow has passed, the track is left clear of snow and well flanged."

Manufacturing Steel Rails in the South.

The steel rail mill of the Roane Iron Co., of Chattanooga, which commenced operations recently, was built in 1869, and up to 1883 was conducted as an iron rail mill. In 1880 a Siemens-Martin steel plant was added at a cost of \$150,000. The mill shut down during 1883, and remained idle until the spring of 1886, when it was decided to convert it into a mammoth Bessemer steel mill. Since September, 1886, about 200 men have been engaged in the work of remodeling, and fully \$175,000 was expended. A five-ton Bessemer converter was erected, and a full equipment of extensive new machinery. On May 7, the work was completed and the great mill began operations. At 8 p. m. the first Bessemer steel rail ever made in the South was turned from the rolls. Over 500 hands are at work at the mill, and 250 tons of steel rails will be turned out daily. The first heavy shipment of 2,500 tons will be made to Birmingham. It is the intention to immediately put in another five ton converter, and to engage also in the manufacture of steel shapes. Chattanooga now has two bessemer plants.

Widdifield & Button Brake.

Messrs. Widdifield & Button explain that their non-appearance at the brake tests is because of delay in getting cars from the Lehigh Valley road. Their 50-car train has been in service on that road since last year's tests, and was called in to be sent to Burlington this year, but the pressure of freight was so great that the road delayed the call till it was too late to get the cars all in. The letter states that recent tests with the brake on a 50-car train have proved exceedingly satisfactory, the slidometer record being 90 per cent. better than last year in emergency stops, and in service stops perfect. It is also stated that the Lehigh Valley will probably soon make some thorough tests of this brake after the Burlington plan.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Fort Worth & Denver City, special meeting, Fort Worth, Tex., June 22.

Cumberland & Piedmont, meeting, Cumberland, Md., June 10.

Fort Worth & Rio Grande, annual meeting, at the office, Fort Worth, Tex., June 7.

Minnesota & Northwestern, annual meeting, at the office, St. Paul, Minn., June 8.

Ogdensburg & Lake Champlain, annual meeting, at the office, Ogdensburg, N. Y., June 15.

St. Paul & Duluth, annual meeting, at the office, St. Paul, Minn., June 20.

St. Paul & Sioux City, annual meeting, at the office, St. Paul, Minn., June 4.

Illinois Central, meeting, Chicago, June 17.

Chicago Burlington & Northern, annual meeting, at the office, La Crosse, Wis., June 8.
St Paul & Northern Pacific, annual meeting, in New York, June 1.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:
 The *Master Car-Builders' Club* holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.
 The *Master Car-Builders' Association* holds its annual convention at Minneapolis, Minn., June 14.
 The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.
 The *American Society of Civil Engineers* holds its annual convention at the Hotel Kaaterskill, Hudson River, N. Y., the first week of July.
 The *American Railway Master Mechanics' Association* holds its annual convention in St. Paul, Minn., June 21.
 The *American Association of Train Dispatchers* holds its annual convention in Boston on June 16.
 The *Brotherhood of Locomotive Engineers* will meet in Columbus, O., on May 29.
 The *Traveling Passenger Agents' Association* holds its annual convention at Old Point Comfort, Va., on June 14.
 The *Western Association of General Passenger and Ticket Agents* will hold a meeting in Chicago on June 8.

PERSONAL.

—C. H. Roberts has resigned the position of Purchasing Agent of the New York, Rutland & Montreal.
 James R. Hardy, Superintendent of the Kansas City, St. Joseph & Council Bluffs Road, has resigned his position.
 —George B. Edwards, Eastern Manager of the Star Union Freight Line, died suddenly on May 19, at Pittsburgh, Pa.
 —W. P. Clough, counsel for the Northern Pacific, has resigned his position to go into the Executive department of the St. Paul, Minneapolis & Manitoba.
 —John E. Utt, General Freight Agent of the Burlington, Cedar Rapids & Northern has been made Commissioner of the Lincoln, Neb., Freight Bureau.
 —Reuben Wells, formerly of the Louisville & Nashville road, is now Superintendent of the Rogers Locomotive and Machine Works, of Paterson, N. J.
 —Mr. H. A. Little, who has been so long and so well-known to most railroad officers, has been appointed representative of the Safety Car-heating & Lighting Co., of No. 160 Broadway, New York.
 —Vice-President Thomas F. Oakes, of the Northern Pacific, has denied the report that he has been offered the Presidency of the Chicago, Milwaukee & St. Paul. He does not intend leaving the Northern Pacific.
 —Philip B. Shumway, a well-known railroad builder, died on May 16, of apoplexy, in Evansville, Ind. He was President of the Joliet, Aurora & Northern and Manager of the Elgin, Joliet & Eastern, now in process of construction.
 —L. H. Clarke, who has been Chief Engineer of the Lake Shore & Michigan Southern for the past 10 years, and who, for 24 years previous to that, was Chief Engineer of the Illinois Central, has retired from his active position with the former company. He will continue in its service as Consulting Engineer.

ELECTIONS AND APPOINTMENTS.

Alabama & Tennessee.—H. S. Chamberlain has been elected President. The road is yet to be built from Stevenson, Ala., to Chattanooga, Tenn., by the East Tennessee, Virginia & Georgia Company.
Atlantic City & Brigantine Beach.—This recently incorporated company has organized by the election of the following officers: President, John K. Cuming; Secretary and Treasurer, John Roberts; Solicitor, George S. Graham; Directors, John K. Cuming, N. Lippman and George R. Krickbaum, of Philadelphia, and Thomas K. Reeves, M.D., John J. Gardner, Louis Kuehnle and Richard H. Turner, of Atlantic City, N. J.
Atlantic & Pacific.—The following directors were elected at the recent annual meeting: Henry C. Nutt, Edwin F. Winslow, Jesse Seligman, C. P. Huntington, William F. Buckley, Walter L. Frost, Bryce Gray, William B. Strong, C. C. Burr, B. P. Cheney, A. W. Nickerson, George O. Shattuck, and Levi C. Wade.
Atchison, Topeka & Santa Fe.—Robert F. Kinnard has been appointed Division Freight and Ticket Agent, headquarters at Wichita, Kan.
Boston & Albany.—Joseph C. Lenix has been appointed General Baggage Agent, in place of George A. Morton.
Boston & Quebec Air Line.—The directors of this new Maine corporation are: William G. S. Keene, Turner Huswell, Augustus R. Bixby, Omar Clark, William Philbrick and Charles A. Marston.
Burlington, Cedar Rapids & Northern.—The old board of directors has been elected and also the former officers.
Canadian Pacific.—J. Niblock is transferred from the line between Winnipeg and Port Arthur to the portion between Donald and Swift Current, headquarters at Medicine Hat. H. P. Timmerman succeeds Mr. Niblock as Assistant Superintendent between Winnipeg and Port Arthur, headquarters at the latter place. Thomas Tait is appointed Assistant Superintendent between Brandon and Swift Current, headquarters at Moose Jaw.
Chicago, St. Louis & Paducah.—William K. Murphy, of Murphysboro, Ill., is President, and E. W. Muenscher is Chief Engineer.
Chippewa Falls & Ashland.—The incorporators of this new Wisconsin company are Thad. C. Pound, L. C. Stanley, Alex. McLaren, Wm. Irvine, R. D. Marshall, Wm. McCord and L. J. Rusk, of Chippewa Falls.
Cincinnati, New Orleans & Texas Pacific.—C. C. Harvey has been elected Vice-President.
Concord.—At the annual meeting this week the old board of directors, with the name of Alpha J. Pillsbury substituted for that of the late J. W. Johnson, was re-elected.
Connecticut Central.—At the annual meeting last week the following directors were elected: Daniel D. Warren, Russell L. Wheeler, Edward Prickett, C. C. Kimball, David Gordon, T. M. Maltbie, W. S. Calvin, S. E. Baldwin, H. P. Stedman, J. H. Thompson and John Middleton. These chose D. D. Warren President; R. L. Wheeler, Vice-President, and T. M. Maltbie, Secretary.

East & West Alabama.—At a meeting this week George H. Pell was elected President; John Postell, Vice-President and General Manager; Poland B. Hazard, Treasurer. The road runs from Cartersville, Ga., to Pell City, Ala., where it will connect with the Georgia Pacific.

Erie & Illinois.—C. W. Reed, of Erie, Pa., has been appointed President of this new company, which has been formed to operate the New York, Chicago & St. Louis road in the state of Pennsylvania until the new New York, Chicago & St. Louis Co. can take charge of the property.

Eufaula & Southeast Alabama.—The incorporators of this new Alabama company are J. W. Tullis, S. H. Dent, George C. McCormick, L. Y. Dean, Harmon Lampley, James Long and G. L. Conner, all of Eufaula, except Mr. Long, who is of Louisville, Ala.

Freeport, Dodgeville & Northern.—The incorporators of this Wisconsin company are Isham Randolph, Chief Engineer of the Illinois Central; Lewis J. Moore and B. Mee, of Chicago; James J. Neff, of Freeport, and James S. Waddington, of Argyle, Wis.

Gulf, Colorado & Santa Fe.—W. B. Strong has been elected President, in place of George Sealey, resigned. C. W. Smith succeeds R. S. Williams as First Vice-President. P. E. Fairchild has been elected Auditor, and George Peck General Solicitor. Thomas W. Jackson succeeds W. S. Davis as a director.

Havana & Quincy.—The incorporators of this new Illinois company are: Wm. H. Collins, Albert W. Wells, Wm. B. Larkworthy, Quincy; Alex. M. Lowry, Mount Sterling; Thomas Havener, Veinmont, Ill.; I. N. Pearson, Macomb; John M. Darnell, Rushville.

Kansas City, St. Joseph & Council Bluffs.—G. N. Nohl has been appointed Superintendent, in place of J. R. Hardy, resigned. J. T. Dyer has been appointed Superintendent of Telegraph and Chief Train Dispatcher.

Kansas & Gulf Short Line.—W. P. Homan has been appointed General Manager.

Lake Shore & Michigan Southern.—G. R. Hardy has been promoted from the position of Assistant Engineer to that of Chief Engineer, in place of L. H. Clarke, who retires to become Consulting Engineer.

Missouri Pacific.—Thomas F. Fisher has been appointed Assistant General Freight and Passenger Agent, with office at Wichita, Kan. Frank Hufsmith has been appointed Assistant Superintendent of the divisions in Iowa.

Montana & Coeur d'Alene.—The incorporators of this new Montana company are G. W. Griggs, A. G. Foster, C. M. Griggs, Frank Blakeslee and Frank B. Clarke, of St. Paul, Minn.

New York Central & Hudson River.—The directors met this week and elected the old officers.

Northern & Eastern Midland.—The incorporators of this new Illinois company are: Wm. H. Turner, Mervin Tebor and Francis W. S. Brawley, of Chicago; Wm. F. Brewster and Wm. A. Bunton, of Boston.

Queensborough & Nashville.—B. H. Mann has been appointed Superintendent, vice W. M. Newbold assigned to other duties.

Pennsylvania Company.—J. Good Ruple has been appointed District Passenger Agent, with headquarters at Columbus, O.

Penobscot Central.—The corporation organized at East Corinth, Me., last week, by choosing the following directors: John Morrison and Mr. Wheeler, of Corinth; I. J. Peaks and J. H. Higgins, of Charleston; S. J. Jerrard, of Levant; T. P. Batchelder, P. O. Beal, P. A. Wilson and J. B. Nickels, of Kenduskeag; William T. Pearson, C. V. Lord and George Varnoy, of Bangor; M. D. Kingsbury, of Bradford; Mr. Hutchinson, of Atkinson; and George S. Clark, of Garland, Me. Subsequently the directors organized by the choice of John Morrison as President and T. P. Batchelder as Secretary.

Pittsburgh, Fort Wayne & Chicago.—John Sherman, L. B. Harrison and George B. Roberts, whose terms had expired, have been re-elected directors. Officers: L. H. Meyer, President; John J. Haley, Secretary and Treasurer.

Randolph Belt.—The incorporators of this new Missouri company are A. A. Talmage of St. Louis, L. R. Moore, Jas. Hoefner, M. A. Potts and E. L. Martin, of Kansas City.

St. Mary's & Southwestern.—The incorporators of this Ohio company are: Calvin S. Brice, Samuel Thomas, C. W. Riskey, John Carlisle and James B. Townsend. Capital stock, \$200,000.

Sonora.—J. F. Goddard has been appointed General Manager, headquarters at Topeka, Kan. W. F. White is appointed Traffic Manager.

Star Union Line.—John T. Denison is to act as Eastern Manager, vice George B. Edwards, deceased.

Toledo, Ann Arbor & North Michigan.—W. W. Belts has been appointed Traveling Agent, with headquarters at Toledo.

OLD AND NEW ROADS.

Atlanta, Nashville & Baltimore.—The charter of the company has been transferred by President Atkinson to T. J. Howell, of New York. Work is to begin within six months.

Atchison, Topeka & Santa Fe.—Sixteen locomotives have been sent west to this company from New England during the week. Tracklaying on the Arizona Mineral Belt road has been delayed for weeks through the inability of the Atchison road to deliver rails. Some 30 miles of the road are graded and 20 miles of track laid.

Augusta & Chattanooga.—The contract for building this road has been awarded to Blair, Boynton & Co., of New York.

Boston & Lowell.—The stockholders have voted to authorize an issue of \$2,000,000 bonds for the completion of the Central Massachusetts road.

The stockholders also ratified the lease of the Connecticut & Passumpsic Rivers road.

Boston & Quebec Air Line.—A certificate of organization has just been issued to this company. The preliminary survey for the road is now completed. It is from Skowhegan, Me., to a junction with the International at Jackman-town. Capital stock of the company, \$450,000, divided into 4,500 shares of \$100 each, all of which has been subscribed. William G. S. Keene, of Lynn, Mass., holds 4,489 shares.

Cairo Short Line.—Arrangements have been completed for extending the road from Marion, Ill., to New Burdies, 20 miles, striking the Cairo, Vincennes & Chicago at the latter place. There is a large amount of excavating

and filling to be done, and trestles to be built. Everything is expected to be completed by next October. The new branch is called the Chicago, St. Louis & Paducah.

Canadian Pacific.—The Manitoba Provincial Government wishes to grant a charter to the Northern Pacific for the building of a line from the boundary to Winnipeg. Sir George Stephen, President of the Canadian Pacific, has protested against such a course, and in a communication to Premier Norquay, of Manitoba, threatens that should the "mischievous agitation" against his company be persisted in, the western shops of the Canadian Pacific will be built at Fort William. It is understood that the government has also been informed that the company will build a direct line from Selkirk to Portage La Prairie, thus avoiding Winnipeg. Premier Norquay has sent a reply to Sir George Stephen, disclaiming the charge that the contemplated action of the government is a breach of faith to the holders of Canadian Pacific securities, and asserting that "the government is acting on behalf of the province, uninfluenced by the attitude of the railroad or the city of Winnipeg."

Vice-President Van Horne is in Chicago to establish a new through route from that city and St. Louis to Montreal, to compete with the Chicago & Grand Trunk. The intention is to run through freight from Chicago over the Baltimore & Ohio to Butler; thence over the Wabash, St. Louis & Pacific to Detroit; thence over the Michigan Central to St. Thomas, Ont., and from there to Montreal over the Canadian Pacific. At Montreal connection is made for Boston and all New England points. From St. Louis the line is to run over the Wabash, St. Louis & Pacific to Toledo; thence by the Michigan Central, etc. Through passenger cars will also be run between Chicago and Montreal by the route here described. The arrangements for beginning operations by this new line are said to be completed.

Sir George Stephen says that his company proposes to go into the grain handling and purchasing business in the Northwest and Manitoba. Large mills are to be built at Kewatin. The company has asked permission from the Treasury Department to bond goods on the steamship line between San Francisco and the western termini of the road, Port Moody. If this is accomplished, goods shipped in bond from San Francisco to Port Moody can be carried under the same bond over the Canadian Pacific road to any place within the United States.

Central of Georgia.—The company will extend its line from Blakely, Ga., to Columbia, 12 miles. A declaration, signed by E. P. Alexander, President of this company, and others, has been sent to the Secretary of State of Georgia for the purpose of forming a corporation to build a road from Columbia to Mobile, to be known as the South Alabama Railway. This will be a continuation of the road from Blakely to Columbia.

Central Iowa.—The Re-organization Committee have published their plan, which was agreed to by representatives of all interests at the last meeting of the committee. It proposes to purchase the several divisions at foreclosure, and to organize a new company, which shall issue the following securities: \$7,500,000 first mortgage 5 per cent. bonds, requiring \$375,000 per annum for fixed charges; \$1,379,625 temporary debt certificates, convertible into preferred stock; \$6,000,000 preferred stock and \$11,000,000 common stock. The bondholders of the present company will receive for each \$1,000 on the main line \$900 in new 5s and \$200 preferred stock; for each \$1,000 Eastern Division bond \$532 in new 5s and \$758 in preferred stock; for each Illinois Division bond \$515 in new 5s and \$734 in preferred stock, and for each \$1,000 consolidated bond \$425 in new 5s and the balance in preferred stock. The car trusts will receive half their face value in new 5s and half in preferred stock. The present debt certificates will be assessed 2½ per cent., the first preferred stock 5 per cent., the second preferred stock 10 per cent., and the common stock 15 per cent., on the payment of which they will receive par in new common stock for the present securities and temporary debt certificates for the assessment paid. The committee states that a majority of the first mortgage bonds have already been deposited under the plan.

Chatham & Harwich.—Ground was broken this week on the new road between Chatham and Harwich, Mass.

Chautauqua Lake.—Willard White, President of the company, has bought the Redstack line of steamboats from the Buffalo, New York & Philadelphia, with three miles of track from Maysville, N. Y., to the Chautauqua Assembly grounds. The amount paid was \$120,000. The boats will be run in connection with the new road.

Chesapeake & Ohio Canal.—Water was let into the canal again on May 22 and navigation resumed after a suspension of 14 days, caused by the break at the Little Monocacy.

Chicago, Burlington & Quincy.—At the recent annual meeting the stockholders ratified the action of the directors in regard to aiding in the construction of and leasing and purchasing the following roads and their branches: Galesburg & Rio, Nebraska & Colorado, Omaha & North Platte, Grand Island & Wyoming Central, Republican Valley & Wyoming, Oxford & Kansas, Chicago, Nebraska & Kansas, Republican Valley, Kansas Southwestern and Beaver Valley & Eastern Colorado.

Chicago, Milwaukee & St. Paul.—The Supreme Court of the United States has decided favorably to the railroad company in a case of one Barnes, which involved about \$18,000,000. Twenty years ago the present company, at a sale under the first mortgage bonds, bought the old La Crosse & Milwaukee line, now in part the La Crosse division of the road. Barnes and his associates were holders of the second mortgage bonds, but made no attempt to save their rights, and were cut off by the sale. Years afterwards, when the property became valuable, they made the claim in dispute, which is now decided against them. The company is extending its line from Albany, Wis., to New Glarus in Green County, 12 miles.

Chicago, St. Louis & Paducah.—This company was organized a few weeks ago to build a road from Marion, Ill., to Paducah, Ky., as an extension of the Marion division of the Cairo Short Line. The first division of 15 miles is located, and the contract for grading and bridging has been awarded to N. W. Irish, of Carlyle, Ill., to be completed by Oct. 15. The city of Paducah has voted \$100,000. The Chief Engineer is now locating another 10-mile section through the Ozark Range.

Chippewa Falls & Ashland.—Articles of incorporation filed in Wisconsin. The road is to extend from Chippewa Falls to Ashland, 130 miles, principal office at Chippewa Falls. Capital stock, \$3,000,000.

Cincinnati, Hamilton & Dayton.—At the stockholders' meeting on June 21 the following propositions will be voted upon: The leasing or the construction of a road from Hamilton to Middletown, O., intersecting the Cincinnati, Hamilton & Dayton north of Middletown. The leasing for 99 years of the "United Railway Terminals" of Cincinnati. The issuing of \$2,500,000 bonds for the extension and im-

provement of the road at a rate of interest not to exceed 4½ per cent.

Connecticut Central.—At the annual meeting, last week, the New York & New England Co. was enjoined from voting, as a stockholder, on the proposition to sell to the New York & New England the equity of redemption of the mortgage of \$325,000 on the Connecticut Central. The injunction was obtained by Henry L. Goodwin. The proposition to sell the equity of redemption was then voted down.

Cumberland, Moorfield & Southwest Virginia.—Chief Engineer Gaffney has started the survey for this proposed road from Cumberland, Md., to Moorefield, W. Va.

Dayton & Ironton.—A bill of complaint has been filed against the company by trustees of an organization of the minority stockholders. They pray for relief and an injunction to prevent the sale of the road, an action that would destroy their rights.

Denver & Rio Grande.—McMurtrie & Streeter, of Denver, Col., have the contract for building the extension of this road from Glenwood to Aspen, Col.

Eufaula & Southeast Alabama.—Articles of incorporation have been filed in Alabama. The proposed road will run from Clayton, Barbour County, to Blakely, in Baldwin County. Also a branch from some point on the main line to Geneva. Capital stock, \$1,000,000.

Erie & Illinois.—Articles of incorporation have been filed in Pennsylvania. The new company is formed to operate the New York, Chicago & St. Louis road in that state. Sixty days' notice is required by the laws of Pennsylvania before a railroad company in that state can consolidate with companies of other states, so at least that time must elapse before the new New York, Chicago & St. Louis Company can take charge of the property.

Fitchburg.—The stockholders have confirmed the purchase of the Boston, Hoosac Tunnel & Western, and its leased line, the Troy, Saratoga & Northern. The latter includes the old Hoosac & Saratoga and Saratoga Lake roads.

Freeport, Dodgeville & Northern.—Articles of incorporation filed in Wisconsin. The object is to construct a line from a point on the Chicago, Madison and Northern, in the town of Cadiz, Green County, northwestward to Dodgeville, 40 miles. Capital stock, \$1,000,000.

Galveston, Sabine & St. Louis.—The road, which extends from Longview, Tex., to Martin's Creek, 22 miles, was changed to standard gauge on May 23. It will be extended to Carthage, which place is expected to be reached in November next, and then to a connection with the Houston, East & West Texas road.

Grigsby Bros., of Jefferson, Tex., have received the contract for grading this road from its present terminus near Longview, to Carthage, Tex., work to be finished in 90 days.

Grand Trunk.—The company has advertised for men to work on the extension of its system to Winnipeg via Sault Ste. Marie. The present intention is to have the new line in operation by Nov. 1. Winnipeg will be the western terminus and the workshops of the company will be located there. Satisfactory arrangements have been made for running over the Manitoba & Northwestern road. The contract for the Portage La Prairie branch will soon be decided.

Havana & Quincy.—Articles of incorporation filed in Illinois. The object of the company is to build a road from Havana to Quincy, Ill., about 100 miles.

Illinois Central.—There will be a meeting of stockholders in Chicago on June 17 for the purpose of acting upon the recommendation of the directors set forth in the following proposition: That the capital stock of the company be increased by a new issue of 100,000 shares, each stockholder to have the privilege of subscribing, at par, for 33⅓ per cent. of the amount of stock registered in his name on the transfer books at the close of business June 1, 1887, and that payments for such subscription be made as follows: On July 1, 1887, 30 per cent. of the subscriptions; on Aug. 1, 1887, 30 per cent.; and Sept. 1, 1887, the remaining 40 per cent.

That scrip shall be issued to subscribers for the new stock in evidence of the respective payments made on account thereof, which scrip shall bear interest at the rate of 4 per cent. per annum, from the date of its issue until Sept. 1, 1887, pass by delivery and be convertible on and after Sept. 5, 1887, when presented at the company's office, in New York, in sums of one hundred dollars, or multiples thereof, into full paid stock, which shall be entitled to share in all dividends declared after Sept. 1, 1887. Every subscriber shall, on or at any time after July 1, 1887, have the further privilege of anticipating the second and third payments.

It is announced that President Fish offers to lease the tunnel and approach in East Dubuque, Ill., to the bridge company for the use and benefit of all other roads desiring to cross the Mississippi. The proposition will probably be accepted, as it does away with the necessity of building another bridge at this point.

Indianapolis, Decatur & Springfield.—The road was sold under foreclosure in New York on May 25. It was bought for \$650,000 by J. D. Probst, representing the reorganization committee of second mortgage bondholders.

Iowa.—The Iowa Railway Co. has been incorporated at Des Moines, Ia. The proposed road is from Des Moines to the Big Sioux River, in Lyon County, and thence into Dakota. Capital stock, \$9,680,000. Office in Des Moines.

Lake Erie & Western.—The company has shut down its repair shops at Lafayette, Ind., discharging all the men. The move was necessitated by slack business.

Louisville & Nashville.—The city of Montgomery, Ala., has filed a bill in the Chancery Court against this company. The city owned 4,000 shares in the capital stock of the South & North Alabama road. In 1869 the latter company made a contract for the completion and equipment of its road for about \$5,000,000. The Louisville & Nashville was anxious to get control of the road, and to that end purchased the contract from the original contractors for \$75,000. But before the contract was assigned to the Louisville & Nashville it was modified so that the contractors should get in part payment for work preferred stock of the South & North road, interest guaranteed at 6 per cent., to be taken at 40 cents on the dollar in lieu of second mortgage bonds at 66 cents on the dollar as originally provided. On these terms the Louisville & Nashville had \$2,000,000 of such stock issued to itself, and made a further contract that no other stock should ever be issued other than the \$1,600,000 then out and its own \$2,000,000, thus virtually providing for itself a perpetual majority of the stock. The bill filed by the city of Montgomery prays for a receiver of the South & North Alabama road, an injunction to prohibit the Louisville & Nashville from voting or using the \$2,000,000 of preferred stock, for a full statement of accounts between the two companies from 1872 up to date, and for general relief.

Memphis & Little Rock.—The road was sold on May 23, at Little Rock, Ark., by order of the United States Court. It was bought by G. B. Rose for R. K. Dow and others for \$100,000. The road is subject to two mortgages, one for \$250,000 and one for \$2,000,000.

Mexican National.—This road and its branches were sold on May 23 to the purchasing committee of the new National Company. Work will begin in June on the gap of 364 miles in the main line. It is expected to be finished in one year from the time it is commenced.

The new company is to issue new first mortgage bonds to the extent of \$12,500,000, or at the rate of \$9,000 a mile, out of the proceeds of which the unfinished portion of the line will be completed. The government subsidy, available when the road is completed, is expected to discharge the new obligation, when the present bonds will become again a first lien on the property. The result of the sale is to give the new company the main line from the City of Mexico to Laredo, and to the Construction Company the branches which formed the inter-oceanic lines of the old company.

Missouri Pacific.—Hugh Burns is in charge of the work of the San Marcos extension of this road. Some 50 or 75 miles of road are to be built from San Marcos, Tex., on the International & Great Northern, in the direction of Seguin and Sutherland Springs.

The company has let contracts for two lines, one from Warwick, Kan., to Hastings, Neb., the other from Talmage, Otee County, to Crete, Neb. From Crete the line will continue westward through the counties of Saline, Fillmore and Clay to a connection with the Warwick line to Hastings.

Mobile & Birmingham.—The company has advertised for 1000,000 cross-ties, to be used in Clarke County, Ala. Rails for 35 miles north of Jackson are on their way to Grove Hill, and tracklaying will begin on their arrival.

Mobile & Dauphin Island.—The contract has been let for building this road from Mobile, Ala., to Dauphin Island, 36 miles. Work has already begun.

Mobile & Northwestern.—This road, which extends from Glendale to Clarksville, Miss., is soon to be changed to standard gauge. The people of Helena, Ark., wish to have the line extended to their city, and they will offer terminal facilities to the company pursuant of that result.

Monroton & Buctouche.—Work has been resumed on the New Brunswick road. Tracklaying is in progress from Cocaigne. The line will be 32 miles long.

Montana & Coeur d'Alene.—Articles of incorporation filed in Montana. The company proposes to build a road from some point on the Northern Pacific near Thompson Falls to some point on the Coeur d'Alene River, and thence down the river to Coeur d'Alene Lake. Capital, \$1,000,000.

Nashua & Lowell.—The annual report of this company, just published, shows that the floating debt has been paid, and that there is a surplus after paying 7½ per cent. dividends. The directors are averse to the proposed transfer of the control of their line to the Boston & Maine by the new lease of the Boston & Lowell, and intimate that they will take legal steps to prevent it if it is attempted.

New Haven & Derby.—W. H. Starbuck, who is said to represent the New York & New England, has offered \$200,000 for the City of New Haven's interest in this road. The offer is under consideration.

The directors have voted to equip all the passenger trains of the road with the Westinghouse automatic brake.

New Mexico Central.—A company filed articles in New Mexico last week, and proposes to build 1,480 miles of road. It is said to be practically an Atchison, Topeka & Santa Fe enterprise. The capital stock of the company is placed at \$43,000,000, and the headquarters are at Santa Fe, N. M. Of the capital stock \$1,635,000 has been subscribed. Four routes for the new line are at present under consideration by the projectors.

New York, Chicago & St. Louis.—W. K. Vanderbilt, F. P. Olcott, James A. Roosevelt and John S. Kennedy bought the road on May 19. These gentlemen are the Purchasing Committee appointed by the company's stockholders and creditors under the reorganization plan. Receiver Caldwell was auctioneer. The road was sold for \$16,000,000. Mr. Vanderbilt has said that no important changes will be made in operating the road.

General Counsel Williamson and J. E. Stillman are in Chicago, securing the confirmation of the foreclosure sales of this property in the Illinois courts. After this is accomplished they will go to Fort Wayne, Ind., on the same errand. New state companies will probably be formed at each of these points to operate the road until a consolidation of the different portions of the property in various states can be effected.

New York, Lake Erie & Western.—The company has closed a contract for the building of two large iron steamers, to cost \$120,000, and to be completed by August 1. These boats are to connect with the Erie at Lakewood, N. Y., on Chautauqua Lake, and convey passengers to the Chautauqua assembly grounds.

New York, New Haven & Hartford.—The directors have voted to take a 99 years lease of the Hartford & Connecticut Valley Road, at 4 per cent. a year. The directors of the latter road have also voted to consummate the lease on the terms named. The directors of the New Haven have authorized the president of the company to negotiate for a lease of the Naugatuck road for 99 years at a rental of \$200,000 a year.

Norfolk & Western.—The company has issued a circular relative to the proposed connection with the Louisville & Nashville in Wise County, Va. The Norfolk & Western will build a line 115 miles long, from a point near Graham, on its New River Division. This will be done under the charter of the Clinch Valley road, the line to be known as the Clinch River Division. To provide for this extension and necessary new equipment the company will issue \$2,500,000 five per cent. first mortgage gold bonds to run 70 years, and \$4,000,000 of preferred stock. The increase in the capital stock will be 16 per cent., and of mileage more than 20 per cent. The increase in fixed charges will be \$125,000. The issues will provide needed equipment, clear up all floating debt and leave \$2,000,000 of available assets in the treasury. The bonds have been sold and the stockholders have been offered the privilege of purchasing the 40,000 shares of preferred stock.

Northern & Eastern Midland.—Articles of incorporation filed in Illinois. The road is to extend from Kankakee to Joliet, Ill., about 40 miles. Capital stock, \$1,000,000.

Northern Pacific.—The Cascade Division of this road is nearly finished. The tracks on the Switchback are expected to be joined on May 31. The division from Pasco Junction to Tacoma, Wash., Ter., is 255 miles long. The Switchback is to be used till the Stampede Tunnel is finished in May, 1888. The Northern Pacific will then have an independent line from Duluth, Minn., to Puget Sound.

The company will at once build a large steamship wharf and warehouse at Tacoma, Wash., Ter.

Northwestern Ohio.—Ex-Governor Foster, Frank W. Pierson and John P. Carruthers, of Mansfield, O., are busily engaged taking powers of attorney from the stockholders of the Old Mansfield, Coldwater & Lake Michigan road, now the Northwestern Ohio. These gentlemen own two-thirds of the stock, and will endeavor to have the sale of the road to the Pennsylvania Co. set aside, claiming that the purchase was fraudulent. If they are successful, they intend to complete the road, as originally projected, into northern Michigan.

Old Colony.—The company will build three new bridges in Wareham, Mass., immediately, two of iron and one of wood.

Oregon Railway & Navigation Co.—At a meeting this week the directors authorized the President to accept a franchise granted by the last Oregon Legislature to build a railroad bridge across the Willamette River at Portland. Work on the bridge will be commenced at once.

Orleans, West Baden & French Lick.—The road is completed from Orleans to French Lick, Orange County, Ind.

Pacific.—The Pacific Railway Commission is in Boston this week, and has engaged itself in investigating the affairs of the Union Pacific. The commission expects to give hearings every day for a week or ten days.

Pennsylvania.—The earnings of the lines east of Pittsburgh, for April, show an increase of \$480,217 gross; an increase in expenses of \$450,198; an increase in net earnings of \$30,019. The four months of 1887, as compared with the same period of 1886, show an increase in gross earnings of \$1,858,343; an increase in expenses of \$1,322,801; an increase in net earnings of \$535,545. All lines west of Pittsburgh and Erie for the four months of 1887 show a surplus over all liabilities of \$623,600, being a gain as compared with the same period of 1886 of \$753,479.

The company has made a traffic agreement with the Delaware & Hudson Canal Co. The Lehigh Navigation Co.'s lease of the latter's lines, between Scranton and Wilkes-Barre, Pa., has expired, and a new arrangement is made with the Pennsylvania, by which a large amount of that company's coal and freight traffic will go over the Delaware & Hudson's lines.

Pennsylvania Company.—The Lawrence Railroad and the New Brighton & New Castle, two small lines running through the Mahoning Valley, O., have been consolidated with a capital stock of \$1,000,000. The Alliance, Niles & Ashtubula and the Ashtubula & Pittsburgh are to be consolidated, and then a meeting will be held to consolidate the two corporations into one new system which will take a new name. This is to give the Pennsylvania Company control of the lines necessary for an outlet from Pittsburgh to the lakes and Northern Ohio.

Pittsboro.—The people of Chatham and neighboring counties in North Carolina celebrated in an enthusiastic way the completion of this road on May 20. The orators of the occasion alleged that it was a "red letter day in the history of Pittsboro." The new road extends from that town to Moncure, 11 miles.

Pullman's Palace Car Co.—The court has ordered the Philadelphia Trust Co. to pay to the Central Transportation Co. all the funds now in hand, according to the account filed in the Pullman Palace Car Co.'s suit. The amount held by the trust company is \$628,020.

Randolph Belt.—Articles of incorporation filed in Missouri. The company proposes to build a standard gauge road from Randolph, Clay County, to a point south of Mineville, thence north to the Wabash, St. Louis & Pacific road.

Richmond & West Point Terminal.—Negotiations, which are likely to have a successful result, are pending between this company and the stockholders of the Asheville & Spartanburg road, by which the former company hopes to get control of the Asheville & Spartanburg, which road extends from Spartanburg, S. C., to Asheville, N. C., 71 miles. The state of Georgia is one of the minority stockholders in this road. All the other minority stockholders have agreed to take 45 cents on the dollar for their holdings, and it is probable that the state will accept the same proposition.

Riverside, Santa Ana & Los Angeles.—Grading on this road is completed through the Santa Ana Cañon in Los Angeles County, Cal., and 15 miles of track are down south of Arlington, the present terminus.

St. Louis & San Francisco.—Seven hundred men are at work on the extension of this road east from Fort Smith, Ark. Seventeen miles through the most difficult country are expected to be finished inside of 60 days.

St. Mary's & Southwestern.—Articles of incorporation filed in Ohio. The road is to run from Delphos to Union City, Ind., through the counties of Darke, Mercer, Anglaise and Allen. Capital stock, \$200,000.

St. Paul, Minneapolis & Manitoba.—The Great Falls extension is completed for 95 miles west of Minot, Dak., and the track is going down at the rate of 5 miles a day. The road will be open to Fort Buford, Dak., 140 miles from Minot, on June 1. Thence to Great Falls, Mont., the distance is 403 miles, and it is expected that trains will be running to that point before the middle of September. There are 6,600 men and 3,000 teams now engaged in the work.

San Bernardino & Bear Valley.—This narrow gauge road is being located up the mountain side, north of San Bernardino, Cal. It will be about 25 miles long, and will open up Bear Valley, the great watershed of Southern California. It will be owned and operated by local capital.

Seattle & West Coast.—A contract has been let to Thomas Earle & Co. for the building of a division of this road from Seattle to Snohomish, W. T., 30 miles, work to be completed Sept. 15. The building of the road beyond Snohomish will be pushed vigorously.

Southern Pacific.—This company has obtained a controlling interest in the Portland & Willamette Valley road, which runs from Portland to Dundee Junction, Oregon, 28½ miles.

Southern Pacific Branch.—Articles of incorporation filed in California. The company was organized on April 9 to build 250 miles of standard gauge road from San Miguel in San Luis Obispo County, connecting there with the Southern Pacific road, and running southeastward through San Luis Obispo, Santa Barbara, Ventura and Los Angeles counties to connect with the Southern Pacific at Newhall, Los Angeles County.

Suwanee & Gulf River.—The company will build a road from Cedar Keys, Fla., to Branford, 60 miles.

Wisconsin Central.—Suit has been brought by Wm. H. Hollister against John A. Stewart and Edwin H. Abbott,

trustees of this company, and Henry F. Spencer, the Registrar. The case grows out of a reorganization scheme made by the company in 1879 for the purpose of settling the affairs of the old company. The complainant demands judgment for bonds and interest aggregating \$500,000.

Tracklaying on the Penokee and Gogebic division from Mellen, Wis., to the Colby mine is completed, and the line will open for business on June 1. Six hundred new cars and twelve locomotives have been lately added to the rolling stock of the company.

Suit has been brought by a bondholder against the trustees of this company, charging them with mismanagement and misappropriating funds. He asks for a receiver for the road pending the suit.

TRAFFIC AND EARNINGS.

Cotton.

Cotton movement for the week ending May 20 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts.....	17,686	18,140	D. 454	46.6
Shipments.....	17,328	43,700	D. 26,372	60.3
Stock.....	64,868	174,496	D. 109,618	62.8
Seaports:				
Receipts.....	10,626	29,447	D. 18,821	63.9
Exports.....	21,227	47,380	D. 26,153	53.2
Stock.....	375,714	596,069	D. 220,355	38.9

Total movement from plantations for crop year to May 20 was 6,257,130 bales, against 6,322,308 last year, 5,559,185 in 1884-85, and 5,575,626 in 1883-84.

Coal.

Coal tonnages for the week ending May 21 are reported as follows:

	1887.	1886.	Inc. or Dec.	P. c.
Anthracite.....	575,909	643,710	D. 67,801	10.6
Bituminous.....	254,441	153,433	I. 101,008	65.8
Coke (May 15).....	15,033	63,946	D. 48,913	76.4

Cumberland coal shipments for the week ending May 21 were 61,566 tons, and for the year to that date 1,182,415 tons, an increase of 783,368 tons as compared with corresponding period last year.

The coal tonnage of the Pennsylvania road for the week ending May 14 is reported as follows:

Line of road.....	Coal.	Coke.	Total.	1886.
.....	201,713	15,033	216,746	162,142
From other lines.....	.....	.....	.....	84,433
Total.....	201,713	15,033	216,746	246,575
Year to date.....	3,808,348	1,512,150	5,320,498	5,193,909

Decrease for the week, 29,829 tons, or 12.0 per cent.; in crease for the year, 126,589 tons, or 2.4 per cent.

The Inter-state Commission.

The General Traffic Manager of the Boston & Albany road has filed with the Commission a complaint against the Boston & Lowell, the Concord, the Northern, the Central Vermont and the Grand Trunk companies, charging these companies, under the name of the National Dispatch Line, with issuing schedules of joint rates to Detroit and other Western points where they come in competition with the Boston & Albany and its connection, which are less than those of the latter company, while at the same time a certain combination of roads, including a part of the roads in the National Dispatch Line, viz.: The Boston & Lowell, Concord, Northern and Central Vermont, maintain higher rates to St. Albans and other intermediate points than the Dispatch Line charges to terminal points.

Representatives of the Lake Shore & Michigan Southern and the Pittsburgh & Lake Erie companies have made argument before the Commission for relief from the fourth section. They ask to be permitted to haul freight from Pittsburgh to eastern points at the same rate made by the Pennsylvania to those points, although those rates may be lower than from some intermediate points from Youngstown eastward. Attorneys for the Pennsylvania opposed the application.

The Chicago & Alton has filed charges against the Pennsylvania, alleging that the company has unlawfully given preference to the Chicago, Burlington & Quincy in the interchange of passengers at Chicago, and denied the Chicago & Alton reasonable facilities for the interchange of passenger traffic. The Chicago, Rock Island & Pacific has filed similar charges against the New York Central & Hudson River. The Commission has ordered the companies complained against to make answer.

The Mississippi Railroad Commission has protested to the Commission against the suspension of the fourth section.

The Cincinnati, Hamilton & Dayton has been heard in support of its petition for a suspension of the long and short haul clause. It claims that its grain trade has had to be abandoned for the reason that the short trunk lines crossing the road fixed the rates so low that they could not be met if local freights were to be reduced in proportion.

The Michigan Central has filed a complaint against the Chicago & Grand Trunk, charging it with selling 1,000-mile tickets to commercial travellers for \$20, while the general public has to pay \$25 for the same tickets.

The Receiver of the Texas & Pacific has filed a petition in the United States Circuit Court at New Orleans, which is expected to bring forth a judicial interpretation of the fourth clause of the Inter-state law. The petitioner sets forth the dangers which managers of railroads are constantly running in making their own interpretations, and argues that "when ever there is an appreciable competition the circumstances and conditions are substantially different from those where there is no competition."

The Commission has adopted a set of rules applicable to the cases with which it is required to deal. These rules set forth a variety of requirements that are expected from petitioners, complainants, etc. Petitions for relief must be addressed to the Commission and must state with particularity all that is desired, the reasons and all facts which make the petition appropriate. Notice must be published in at least two papers along the line of petitioner's road for ten days prior to presentation. The Commission will then take testimony for and against the prayer. A carrier complained against must answer complaint within 20 days from the date of the notice. The petitioner must always prove the existence of the facts alleged to constitute a violation of the act, unless the carrier complained against shall admit the same or neglect to answer the complaint. Copies of any petition are obtainable by any carrier upon application for the same to the Commission.

Asking a Court to Interpret the Law.

General Lionel A. Sheldon, Receiver of the Texas & Pacific, has filed a petition in the U. S. Circuit Court at New Orleans, La., bringing before the Court an interpretation of the fourth clause of the Inter-state law. This proceeding looks to a demand for judicial action in the case that has been laid before the Inter-state Commerce Commission.

The Manchester Ship Canal.

The directors of the Manchester, Eng., Ship Canal have entered into contract for the construction of the canal for \$25,000,000. The contract is conditional on the whole capital being subscribed. The directors now assert that the capital has been secured.

East-bound Shipments.

The shipment of all freight except live stock from Chicago through to seaboard points last week amounted to 28,589 tons, against 28,742 tons the previous week. The percentages of the various roads were as follows: Baltimore & Ohio, 14.5; Chicago & Grand Trunk, 14.9; Pittsburgh, Cincinnati & St. Louis, 11.6; Lake Shore & Michigan Southern, 16.1; Michigan Central, 15.2; New York, Chicago & St. Louis, 8.7; Pittsburgh, Fort Wayne & Chicago, 18.2; Cincinnati, Indianapolis, St. Louis & Chicago, 0.8.

Emigrant Business.

The Baltimore & Ohio and the New York, Ontario & Western have entered the joint agency controlling the emigrant business of trunk lines in Castle Garden, N. Y.

Water Competition.

Rafts containing 400 walnut logs were driven down Red River to Alexandria, La., last week, and were towed from the mouth of the river for shipment to Glasgow. The Interstate law rendered it necessary to float the logs instead of shipping them by rail, as has been the custom heretofore.

Withdrawing Special Rates.

The New York, Pennsylvania & Ohio has withdrawn the special rate of 2 cents per mile to parties of ten or more. The opinion is held by railroad counsel that it is an unjust discrimination against single individuals, and that an individual, upon being refused such a rate, may hold the railroad company amenable for discrimination against him.

Quick Time on the Lakes.

The steamer H. J. Jewett arrived in Chicago May 20, in 63 hours from Buffalo, with a miscellaneous cargo of goods that had been only about five days in transit from New York. A propeller of the Western Transit Company recently delivered a cargo at Chicago in just six days from New York, and then returned with 48,000 bushels of corn to be delivered on board a Cunard steamer at Boston in 9 days from Chicago.

The propeller Tigoga, of the Union Steamboat Co. (New York, Lake Erie & Western road), delivered 1,800 tons of freight in Chicago on the evening of May 24 that had been shipped in New York at 3 o'clock on the morning of May 20. This is claimed to lower the best previous record on freight shipped by rail and lake between the two points almost 24 hours.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of April:	1887.	1886.	Inc. or Dec.	P. c.
Buff. N. Y. & P.....	\$231,501	\$214,276	I. 17,225	8.0
Net earnings.....	63,693	40,338	I. 23,355	57.9
Chic. St. L. & P.....	402,944	352,164	I. 50,780	14.4
Net earnings.....	67,551	27,222	I. 35,329	129.8
Cen. & Atl.....	12,727	.....	.....	.....
Net earnings.....	8,827	.....	.....	.....
Mexican Central.....	354,101	311,554	I. 42,547	13.6
Net earnings.....	140,101	86,862	I. 53,239	61.2
Manhattan Elev.....	713,232	658,918	I. 54,314	8.2
Net earnings.....	323,232	314,978	I. 8,254	2.6
Nash. C. & St. L.....	222,720	172,812	I. 49,908	28.8
Net earnings.....	32,585	61,176	D. 28,591	29.0
Petersburg R. R.....	32,941	.....	.....	.....
Net earnings.....	15,133	.....	.....	.....
Rich. & Peterb.....	19,909	.....	.....	.....
Net earnings.....	7,547	.....	.....	.....
Total (gross).....	\$1,924,498	\$1,709,754	I. 214,744	12.5
Total (net).....	682,162	530,576	I. 151,586	28.5

Month of March:	1887.	1886.	Inc. or Dec.	P. c.
Cairo, V. & C.....	\$63,543	\$48,452	I. 15,091	31.1
Net earnings.....	12,549	9,101	I. 3,448	37.8
Chic. & G. W.....	517,748	.....	.....	.....
Net earnings.....	200,845	110,038	I. 90,807	82.5
Chic. Burl. & N.....	282,398	.....	.....	.....
Net earnings.....	134,361	.....	.....	.....
Gr. Trunk of C.....	1,528,347	1,351,207	I. 177,050	13.0
Net earnings.....	392,021	110,753	I. 281,268	252.8
Chic. & Gr. Tr.....	557,632	280,152	I. 277,480	99.0
Net earnings.....	101,534	25,904	I. 75,630	294.1
Det. G. H. & Mil.....	108,863	102,388	I. 6,475	6.3
Net earnings.....	23,639	23,599	I. 40	.1
Rome, W. & O.....	253,614	152,827	I. 100,787	65.9
Net earnings.....	102,842	51,043	I. 51,799	101.5
Southern Pac. Co.....	252,353	175,581	I. 76,772	43.1
Net earnings.....	3,448	12,523	D. 9,075	72.4
Louis. & W.....	66,374	48,637	I. 17,737	36.5
Net earnings.....	66,374	9,169	I. 57,205	623.8
Morgan's L. & T.....	331,723	335,361	D. 3,638	1.0
Net earnings.....	30,993	7,615	I. 23,378	307.4
N. Y. T. & M.....	12,061	7,314	I. 4,747	65.0
Net earnings.....	1,028	4,944	D. 3,916	381.9
Texas & N. O.....	163,896	73,224	I. 90,672	123.8
Net earnings.....	41,266	13,697	I. 27,569	201.2
Atlantic System.....	765,407	627,120	I. 138,287	22.0
Net earnings.....	41,357	89,866	D. 48,509	53.8
Pacific System.....	2,127,025	1,782,002	I. 345,023	19.3
Net earnings.....	906,896	823,235	I. 83,661	10.1
Total all.....	2,892,431	2,409,122	I. 483,309	20.0
Net earnings.....	948,233	912,921	I. 35,312	3.9

Month of Feb. 28:	1887.	1886.	Inc. or Dec.	P. c.
Grand Tr. of C.....	\$2,387,714	\$2,219,845	I. 167,869	7.5
Net earnings.....	487,381	449,794	I. 37,587	8.3
Chic. & Gr. Tr.....	400,983	405,572	D. 4,589	1.1
Net earnings.....	151,165	30,099	I. 121,066	402.2
D. G. H. & Mil.....	102,125	107,737	D. 5,612	5.3
Net earnings.....	18,635	36,259	D. 17,624	48.5

Month of Jan. 1 to March 31:	1887.	1886.	Inc. or Dec.	P. c.
Balt. & Potomac.....	\$338,210	\$302,513	I. 35,697	11.8
Net earnings.....	110,219	69,110	I. 41,109	59.5
Buff. N. Y. & P.....	501,276	548,678	D. 47,402	8.2
Net earnings.....	11,262	89,791	D. 78,529	87.3
Cairo, V. & C.....	172,630	123,488	I. 49,142	39.8
Net earnings.....	41,875	15,738	I. 26,137	166.4
California South.....	384,081	130,377	I. 253,704	194.4
Net earnings.....	191,335	43,286	I. 148,049	341.8

Month of Dec. 31:	1887.	1886.	Inc. or Dec.	P. c.
Camden & Atl.....	90,452	82,150	I. 8,302	10.0
Net earnings.....	25,528	7,721	I. 17,807	230.6
Canadian Pac.....	1,873,394	1,621,581	I. 251,813	15.5
Net earnings.....	3,997	260,303	D. 256,306	98.5
Cen. of Georgia.....	1,610,877	438,908	I. 1,171,969	267.1
Net earnings.....	577,816	872,564	D. 294,748	33.8
Ches. & Ohio.....	967,688	872,564	I. 95,124	10.9
Net earnings.....	247,999	197,193	I. 50,806	25.8
Ches. O. & S. W.....	422,605	59,809	I. 362,796	594.5
Net earnings.....	159,951	117,875	I. 42,076	35.8
Chl. Bur. & No.....	621,503	.....	.....	.....
Net earnings.....	185,843	.....	.....	.....
Chl. Bur. & Q.....	6,785,302	5,440,410	I. 1,344,892	24.9
Net earnings.....	3,356,197	2,306,219	I. 1,049,978	45.5
Cleve. & Canton.....	78,120	71,169	I. 6,951	9.9
Net earnings.....	12,213	11,350	I. 863	7.5
Den. & R. G. W.....	1,701,311	1,329,834	I. 371,477	27.9
Net earnings.....	684,992	409,417	I. 275,575	67.2
Ft. W. & Den. C.....	139,633	74,215	I. 65,418	88.1
Net earnings.....	55,685	22,875	I. 32,810	144.3
Grand Rap. & I.....	201,290	152,542	I. 48,748	31.8
Grand Tr. of Can.....	3,960,660	3,571,142	I. 389,518	10.9
Net earnings.....	970,155	841,644	I. 128,511	15.2
Chic. & Gr. Tr.....	788,615	684,723	I. 103,892	15.1
Net earnings.....	184,490	105,749	I. 78,741	74.5
Det. G. H. & Mil.....	271,988	270,125	I. 1,863	.6

Three months—Jan. 1 to March 31:

	1887.	1886.	Inc. or Dec.	P. c.
Net earnings.....	42,452	59,859	D. 17,407	29.0
Keokuk & West.....	74,802	65,974	I. 8,828	13.4
Net earnings.....	24,342	27,792	D. 3,450	12.4
Louis. & Nash.....	3,726,776	3,203,887	I. 522,889	16.3
Net earnings.....	1,408,930	1,151,351	I. 257,579	22.3
N. O. & Tex.....	565,140	429,998	I. 135,142	31.3
Net earnings.....	183,314	94,904	I. 88,410	93.1
Mem. & Charles.....	409,137	336,509	I. 72,628	21.6
Net earnings.....	113,329	83,289	I. 30,040	37.2
Mexican Cen.....	1,208,557	934,545	I. 274,012	29.3
Net earnings.....	587,400	523,247	I. 64,153	12.3
Mexican National.....	380,692	24,771	I. 355,921	10.7
Net earnings.....	67,440	67,401	I. 39	.0
Min. & N. W.....	228,326	66,928	I. 161,398	91.7
Net earnings.....	54,978	9,752	I. 45,226	471.1
N. Y. L. E. & W.....	5,412,655	4,876,311	I. 536,344	11.0
Net earnings.....	1,00,221	1,154,250	D. 1,054,029	21.3
N. Y. Ont. & W.....	266,538	256,135	I. 10,403	4.1
Net earnings.....	113,927	113,927	I. 0	0.0
Norfolk & West.....	901,070	718,002	I. 183,077	25.4
Net earnings.....	364,444	282,930	I. 81,514	28.8
Northern Central.....	1,517,959	1,291,231	I. 226,728	17.5
Net earnings.....	640,641	515,785	I. 124,856	24.2
Northern Pac.....	2,128,826	1,92,086	I. 1,936,740	10.1
Net earnings.....	482,761	621,822	D. 139,061	22.3
Total (gross).....	\$30,156,392	\$30,300,087	D. 143,695	0.5
Total (net).....	11,649,496	9,032,108	I. 2,617,388	28.6

Four months—Jan. 1 to April 30:

	1887.	1886.	Inc. or Dec.	P. c.
Atch. Top. & S. Fe.....	\$5,957,696	\$4,490,441	I. 1,467,255	32.6
Buf. N. Y. & Phil.....	781,476	760,754	I. 20,722	2.7
Buf. Rock. & Pitts.....	65,406	451,450	D. 386,044	59.1
Bur. C. Rap. & No.....	938,237	836,154	I. 102,083	12.2</

Rates on Grain to Interior Points.

The Chicago Managers' Committee of the Central Traffic Association met in Chicago this week, with the view of inducing the Chicago & Atlantic to join the other roads in maintaining uniform rates from Chicago to Indiana and Ohio points. It was resolved that the rule for making competitive rates should be that the rates on all classes shall not be less than those of the short line, and the long line shall not reduce the same without consent of the proper freight committees, to which all desired changes must be submitted. After a long discussion on the resolutions that were adopted, the Chicago and Atlantic agreed to a compromise, making the rates on grain from Chicago to Ohio points 11 cents per 100 pounds, one cent less than the rate heretofore charged by the other roads and one cent more than its own previous rate.

Reducing Grain and Flour Rates.

As a result of the refusal of the Chicago, Burlington & Northern to join in the agreement of the other roads in the Northwestern Freight Bureau, the Chicago & Northwestern, Chicago, Milwaukee & St. Paul, Minnesota & Northwestern and Wisconsin Central have issued new tariffs making an open rate on flour from Minneapolis to Chicago of 7½ cents per 100 pounds, the former rate being 18 cents. On grain from Minneapolis and St. Paul to Chicago the Chicago, Milwaukee & St. Paul have made a rate of 10 cents per 100 pounds by its direct line. The making of the rate on the manufactured article less than on the raw material is complained of as unjust and a discrimination against millers at other points than Minneapolis. The Chicago, Burlington & Northern makes a rate of 7½ cents on both flour and grain.

Rates Between the Seaboard and the Missouri River.

The agreement of rates made between the eastern and western roads on through traffic between the seaboard and Missouri River points are now as follows:

New York business, east-bound, west of Chicago—First-class, 86 cents; second, 69 cents; third, 49 cents; fourth, 35 cents; fifth, 30 cents; wheat, 25 cents.

East of Chicago—First-class, 71 cents; second, 61 cents; third, 49 cents; fourth, 35 cents; fifth, 30 cents. When from Atchison, St. Joseph or Leavenworth, wheat 25 cents; other grain, 20 cents; packing house products, 25 cents. When from Council Bluffs and Omaha, wheat, 27 cents; other grain, 22 cents; packing house products, 30 cents. The same divisions will prevail west of Chicago on Boston.

On west-bound traffic the divisions will be the same as east-bound on the first three classes, the through rates being the same both ways, but on the three lower classes the Eastern lines will keep their full local rates to Chicago.

Demand for Foreign Iron.

The closing of furnaces on account of the coke strike in Pennsylvania is compelling the owners of rail mills and Bessemer mills to purchase foreign pig iron.

ANNUAL REPORTS.

St. Louis & San Francisco.

At the close of the last fiscal year, Dec. 31, 1886, the company owned and operated the following lines:

	Miles.
St. Louis to Seneca, Mo.	326.28
Granby Branch, Mo.	1.5
Pierce City, Mo., to Wichita, Kan.	217.40
Oronogo, Mo., to Joplin, Mo.	9.32
Girard to Galena, Kan.	3.25
Plymouth, Mo., to Fort Smith, Ark.	133.27
Springfield to Chadwick, Mo.	34.86
Springfield to Bolivar, Mo.	38.79
Beaumont to Cale, Kan., leased.	61.86
Salem Branch.	34.90

Total owned, leased and operated. 929.59

The company also operates the Central Division of the Atlantic & Pacific, from Seneca to Sapulpa, Ind. Ter., 111.77 miles. The average mileage for 1886 was 877.6 miles, not including A. & P. Central Division.

The equipment at the close of the year consisted of 117 locomotives; 39 passenger, 14 combination, 6 postal, 20 baggage, 3 express, 3 chair and 2 dining cars; 5 Pullman sleeping, 1½ interest, 1 officers', 1 pay, 4 boarding cars and 52 cabooses; 1,888 box, 666 stock, 1,281 gondola, 7 flat, 19 low flat, 60 mining, 2 tank and 2 wrecking cars.

Additions last year were 12 locomotives, 1 passenger and baggage car, 1 passenger and mail car, 2 baggage cars, 1 express, 3 chair, 1 dining, 1½ interest in 2 Pullman sleeping, 150 box, 201 gondola, 7 flat, 60 mining cars and 12 cabooses.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Freight.	\$3,517,578	\$3,120,708	I. \$396,870	12.7
Passenger.	907,288	905,572	I. 1,716	0.3
Mail and express.	203,900	221,413	D. 17,513	7.8
Miscellaneous.	155,792	134,649	I. 21,142	15.7
Total.	\$4,784,677	\$4,382,406	I. \$402,271	11.2
Expenses.	2,222,206	1,940,744	I. 272,562	13.9
Net earnings.	\$2,562,331	\$2,441,662	I. \$120,669	8.0
Gross earn. per mile.	5,554	5,379	I. 175	3.2
Net earn. per m.	3,022	2,986	I. 36	1.2
P. c. of exps.	45.5	45.4	I. 0.1	...

Expenses include taxes and improvements, which amounted last year to \$173,263, against \$140,112 in 1885. The expenses last year were 64.12 cents per locomotive-mile and 5.07 cents per car-mile.

The expenses for the year were divided as follows:

	1886.	1885.
Conducting transportation.	\$713,085	\$603,491
Motive power.	589,131	4,639
Maintenance of way.	478,631	440,276
" " cars.	137,496	138,209
General expenses.	130,688	125,297
Taxes and improvements.	173,263	140,112
Total.	\$2,222,206	\$1,940,745

The general account, condensed, is as follows:

Stock, common.	\$15,000,000
" preferred.	10,000,000
" first preferred.	4,500,000
Funded debt.	25,879,000
Accounts and balances.	4,732,623
Income account.	3,107,225
Total.	\$63,708,848

Road and property.	\$51,078,055
Company's stock in treasury.	3,890,056
Other stocks and bonds, c. st.	2,034,225
Bills and accounts receivable.	6,483,912
Cash.	213,600
Total.	\$63,708,848

The funded debt includes \$7,144,500 South Pacific first mortgage; \$5,668,500 A., B. & C. bonds; \$1,090,000 Missouri & Western; \$1,246,000 trust bonds of 1880; \$651,000 equipment 7s of 1880; \$349,000 equipment 6s of 1884; \$7,732,000 general mortgage 6s; \$2,000,000 St. Louis, Wichita & Western, first mortgage 6s.

The report says: "The most important undertaking of the company in the extension of its system has been the building

of a road from Fort Smith, Ark., southwesterly through the Indian Territory to Paris, Tex., a distance of 169 miles. The road was begun in June, last year, and will be completed and in operation by June of this year." [Tracklaying was completed on this road on May 10.—EDITOR RAILROAD GAZETTE.]

The estimated cost, without equipment, was about \$3,750,000, and it is believed that this limit will not be exceeded by the actual outlay. New cars and engines have been purchased with special reference to this extension, although intended for use also on other roads operated by the company. Means with which to build this line, and buy additional equipment, have been provided by proceeds of the company's general mortgage 5 per cent. bonds. At Paris the new road will connect with the Texas & Pacific Railroad and with the Gulf, Colorado & Santa Fe Railroad. By building about 70 miles to Roberts, Tex., a connection may be made with the Houston & Texas Central Railroad system.

During the year the company has taken a lease for 98 years of the road of the St. Louis, Kansas & Southwestern Railroad Co. This road is a continuation of the Kansas City & Southwestern Railroad already under lease to our company, and, as built, extends westerly from Arkansas City, Cowley County, Kan., through Summer County to Bluff City in Harper County, a distance of 49 miles, and may be extended under its charter through the southern tier of counties to the west boundary of the state.

By the terms of the lease the company is to pay a rent of 25 per cent. of the gross earnings of the leased road, provision being made for a minimum rent equal to the interest on the six per cent. first mortgage bonds of the St. Louis, Kansas & Southwestern Railroad Co., which have been issued at the rate of \$15,000 per mile of main line.

A branch, nine miles in length, has been built from Pittsburg to Weir City, Kan., by the Pittsburgh & Columbus Railroad Co., the capital stock of which is owned by the San Francisco company.

A company was formed during the year under the name of the Fayetteville & Little Rock, to build a branch road southwesterly from Fayetteville, Ark. Twenty-five miles of this road are in operation. About the end of last year the negotiations were concluded for the acquisition of the railroad and property of the St. Louis, Salem & Arkansas, a company formed on the reorganization, after foreclosure of the St. Louis, Salem & Little Rock. This road connects with the main line of the San Francisco at Cuba, Mo., 86 miles southwest of St. Louis, and consists of 54 miles of main line and branches. The cost of the property was \$750,000.

Agreements have recently been made under which the road of the Kansas Midland Railway Company is to be built from the City of Wichita, Kan., where it will connect with the road of the San Francisco company, through Burton and Lyons, to a connection with the Kansas Division of the Union Pacific Railway at Ellsworth, a distance of about 100 miles. The road is to be completed in divisions, which the San Francisco company is to operate under lease for ninety-seven years from the time of completion.

It was thought best to organize a new corporation in Kansas for completing the Wichita & Western Railroad from Kingman to Dodge City, and the Kingman, Pratt & Western Railroad Company was created and has built 44 miles of new road westward from Kingman, the former terminus. A merger of the two corporations will be made and the road completed, equipped and paid for, as hitherto, out of proceeds of first mortgage bonds secured upon the property, the San Francisco assuming no pecuniary obligations, but owning one-half of the capital stock.

This road connects with the Kansas Division of the San Francisco system, and runs through a fine agricultural section of the state. The distance from Wichita to Dodge City is about 150 miles.

Within the year covered by this report, the relations of the San Francisco Co. and the Atchison, Topeka & Santa Fe Railroad Co. with the Atlantic & Pacific Railroad Co. have undergone an important readjustment. This has been accomplished in pursuance of an agreement made between the three companies, under date of Oct. 5, 1886, of the terms and purpose of which the stockholders of this company were informed by a circular issued about that time. The holders of more than 70 per cent. of the outstanding stock of our company, including holders of a majority of each class of stock, have given their express assent to the execution and consummation of this agreement.

Canadian Pacific.

The property owned and operated by this company at the end of the fiscal year, December, 1886, was as follows:

	Miles.
Main Line.	2,892.0
Montreal to Port Moody.	2,892.0
Port Moody to Vancouver.	14.0
Total Main Line.	2,906.0
Eastern Division.	483.8
Western Division.	433.1
Pacific Division.	8.5
Leased Lines.	820.8
Total mileage.	4,651.5

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Freight.	\$6,112,380	\$4,881,800	I. \$1,230,580	25.2
Passenger.	3,170,714	2,859,223	I. 311,491	10.9
Mail and express.	411,906	309,475	I. 102,431	33.1
Sleeping cars.	118,959	73,523	I. 45,436	61.3
Telegraph and miscellaneous.	268,154	244,426	I. 23,728	9.7
Total.	\$10,081,003	\$8,368,493	I. \$1,712,510	20.5
Expenses.	6,378,317	5,143,276	I. 1,235,041	24.0
Net earnings.	\$3,702,686	\$3,225,217	I. \$477,469	14.8

The receipts and expenditures for the year were as follows:

	Receipts.
Surplus revenue.	\$635,444
Dominion government subsidy.	460,087
Proceeds 1st mortgage bonds.	\$20,275,568
Less government loan and interest.	20,166,216
Total.	\$109,352

Ontario & Quebec Railway.

Sale of debenture stock.	\$6,908,293
Less payment of 1885 balance.	\$1,216,018
Less expenditures during 1886.	5,133,282
Balance in hand for completion of work at Montreal and Toronto.	\$1,774,951
Repayment of amount due by Ontario & Quebec.	1,219,018
Accounts receivable.	516,147
Balance on hand, Dec. 31, 1886.	\$5,297,812
Less current liabilities.	3,201,776
Total.	\$3,196,036

Deduct cash on hand, Dec. 31, 1886.	\$2,427,894
Less fund held for accrued fixed charges.	1,222,206
Total.	1,205,888

Balance on hand, Dec. 31, 1886.	\$6,705,343
Less current liabilities.	3,092,291
Total.	\$9,797,640

Expenditures.

Construction and improvements.	\$6,398,713
Equipment.	1,176,661
Increase in material and stores on hand.	87,661
Land D. pariment. ....	...
Expended promoting immigration.	131,314
Amount of land grant bonds received on account of sales in terms of mortgage and canceled by trustees.	\$85,560
10 per cent. premium on redemption.	8,550
Town sites. ....	...
Expenditure at Vancouver.	173,174
Less cash from sales of lots.	158,534
Total.	110,690

Advances—	
To St. Lawrence & Ottawa Railway.	\$7,072
To Atlantic & Northwest Railway.	1,885,503
Total.	1,892,575

The general account is as follows:

Liabilities.	
Capital stock.	\$65,000,000
First mortgage 5 per cent. bonds.	34,998,633
Mortgage bonds on acquired lines.	9,259,386
Land grant bonds (not including \$1,000,000 held by government, not bearing interest and 4,000,000 held by the Co.).	3,527,000
Unpaid vouchers and accounts.	3,092,291
Interest on funded debt and rentals.	1,222,206
Cash subsidy paid by government.	25,000,000
Land grant, net proceeds of sales.	18,664,695
Town site sales.	488,986
Bonuses received from municipalities.	232,600
Total liabilities.	\$161,485,798

Assets.	
Cost of road.	\$129,451,323
Cost of equipment.	10,520,959
Construction plant and tools.	131,107
Real estate in and near Montreal.	407,534
Advances to leased lines.	2,212,513
Accounts receivable.	1,630,037
Materials and supplies on hand.	1,674,382
Dominion government guarantee fund.	11,803,499
Balance due on lands sold.	1,231,559
Cash on hand.	2,427,894
Total.	\$161,485,798

On Dec. 31, 1886, the equipment of the company consisted of 872 locomotives, 304 passenger and baggage cars, 47 sleeping cars, 27 parlor, official and paymaster's cars, 8,253 cattle and freight cars, 178 conductors' vans, and 71 auxiliary cars; also two lake steamers.

On various subjects the report speaks as follows: A temporary service for the present season has been arranged for on very favorable terms, to be performed by three steamships between Vancouver and Yokohama and Hong Kong. Negotiations are in progress with the Imperial Government for the establishment of a first-class line of steamships between Vancouver, China and Japan, and the Imperial interests involved in this question are so important, that there can be little doubt of a satisfactory result.

The establishment of a first-class line of mail and passenger steamships between Canada and the United Kingdom, fully equal in speed and character to any now crossing the Atlantic, is under consideration by the Dominion Government, and it is confidently expected that the necessary steps to this end will be taken immediately. Such a line, while being of the greatest possible advantage to Canada, would also be a most important supplement to the Pacific service contemplated by the company, and could not fail to contribute largely to the trans-continental business of your railway.

On the eastern section of the main line, settlements have advanced far beyond Lake Nipissing. The movement of emigrants to the prairie section is constantly increasing, and the prospects of immigration for this year are unusually favorable. The completion of the railway to British Columbia has given a decided impetus to the growth of that province.

The grain trade of the company is steadily increasing, and since the last annual report a second elevator of 600,000 bushels capacity has been found necessary in Montreal. This has now been completed, bringing the storage capacity at that point up to 1,200,000 bushels.

Large deposits of copper ore have been found near the railway at Sudbury Junction. Large shipments of the ore have already been made, and a number of smelting furnaces are now erecting and will soon be in operation at the mines. Extensive iron deposits have been found near the railway. The silver mines near Port Arthur are yielding ores of remarkable richness. A number of bituminous and anthracite coal mines have been opened on the line between Calgary and the summit of the Rocky Mountains. Discoveries of gold and silver are reported along the road in British Columbia.

The extension of the Algoma Branch from Algoma Mills to Sault Ste. Marie is in active progress, and will be fully completed during the present season without subsidy or bonus of any kind. The American lines approaching Sault Ste. Marie, one from Duluth, and the other from Minneapolis and St. Paul, are expected also to be completed by the end of the year.

The bridge over the St. Mary's River, the outlet of Lake Superior, is under construction, and will be completed by the time the railway lines are ready for traffic. The bridge will be owned jointly by the Canadian Pacific and the two American railway companies, your company owning one-half and the two American companies one-fourth each.

It is proposed to issue mortgage bonds on the existing branch and its extension to the amount of \$20,000 per mile, and a deed of mortgage embodying the same will be submitted for the approval of the shareholders. You will also be asked to make provision for this company's contribution to the cost of the Sault Ste. Marie bridge.

The branch line to New Westminster, 9 miles in length, referred to in the last annual report, was completed and put in operation during the past year. Both of these extensions are covered by the general mortgage securing the first mortgage bonds of the company.

During the year the two branches of the Manitoba Southwestern Railway, owned by this company, were extended, the north line from Holland to Glenboro, 20 miles, and the south line from Bossevain to Deloraine, 20 miles.

Two short branch lines, one four miles and the other one mile long, were built to the copper mines near Sudbury, during the year.

The extension of the Ontario & Quebec road from Smith's Falls to Montreal is nearly completed.

During the past year the Atlantic & Northwest Railway Company, an organization controlled by this company, and created for the purpose of securing the necessary connections with the Maritime Provinces and the Atlantic seaboard, entered into an agreement with the Dominion Government to construct the "Short Line Railway," so-called, extending from the south end of the new St. Lawrence bridge, eastward by the way of Sherbrooke and Lake Megantic, and across the state of Maine to a connection with the railway system of the Provinces of New Brunswick and Nova Scotia.

The Atlantic & Northwest Railway has been leased in perpetuity to the Canadian Pacific Company.